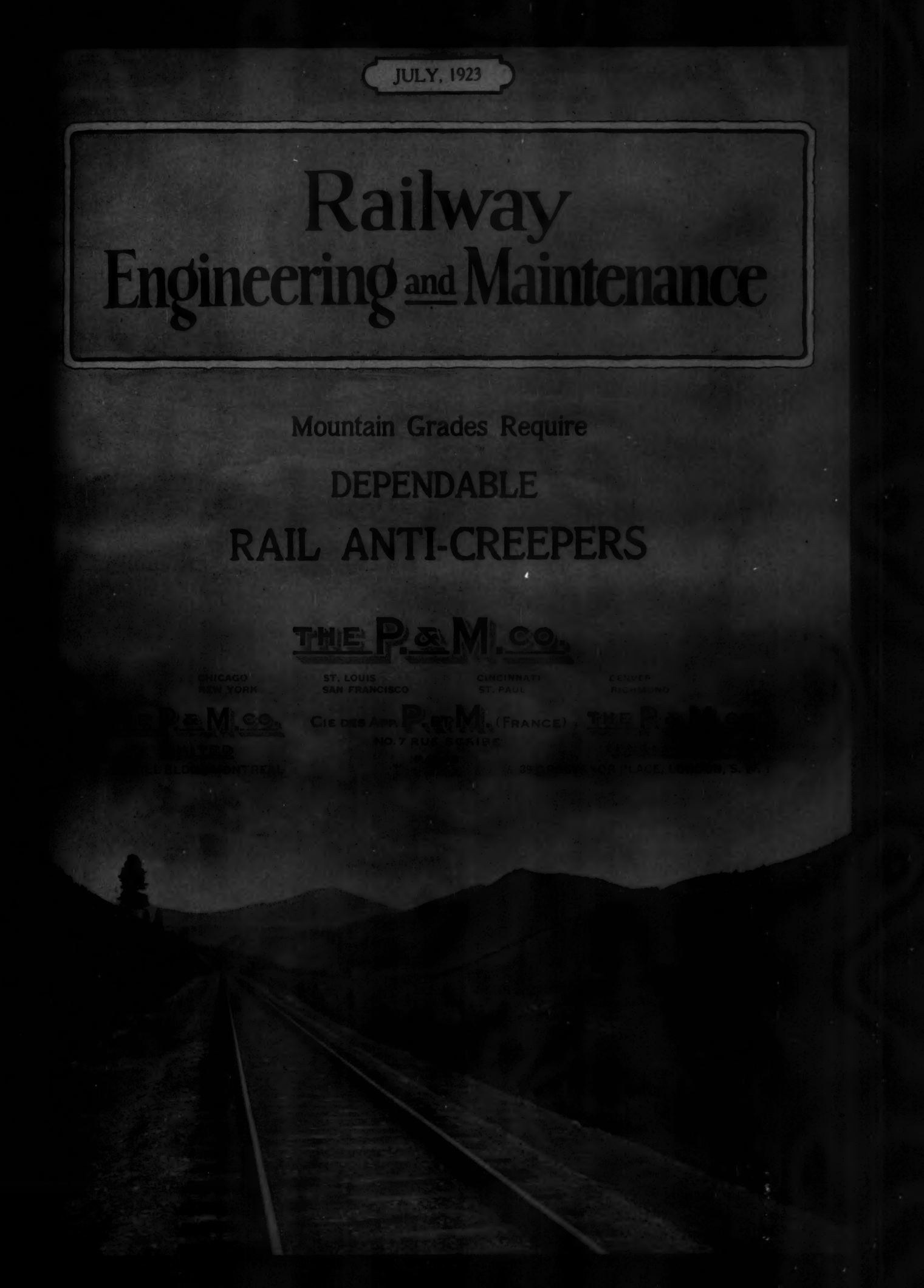
JULY, 1923

Railway Engineering and Maintenance



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Alphabetical Index to Advertisements, Page 38 Classified Index to Advertisers, Pages 36 and 38

Electric Locomotive on Norfolk & Western handling a train of coal up the Elkhorn grade near Bluefield, W. Va.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19 July, 1923 Number 7

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WOULD YOU LIKE TO KNOW

How to design a water treating plant?

How to plan a rail relaying program?

What kind of heating equipment is the best for various buildings?

What results have been obtained from tie treatment?

How railway employees fare on government-owned railroads?

Answers to these and other practical questions will be found elsewhere in this issue.

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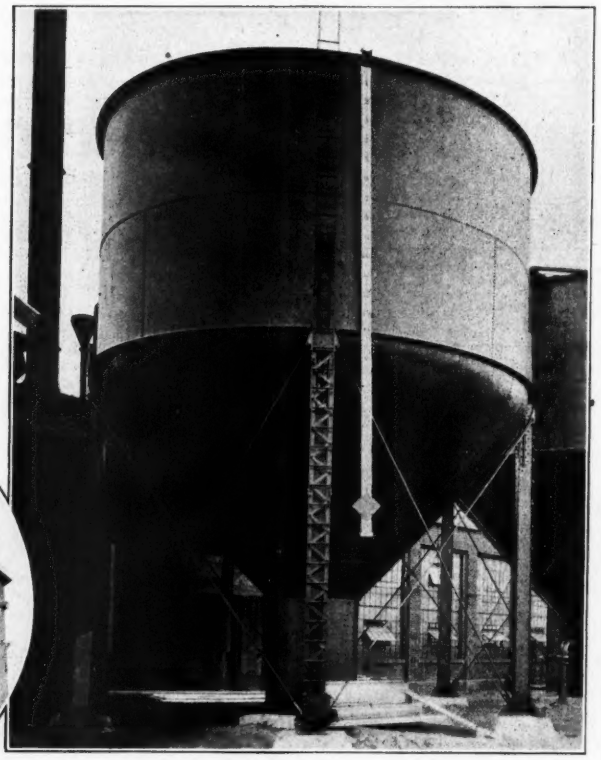

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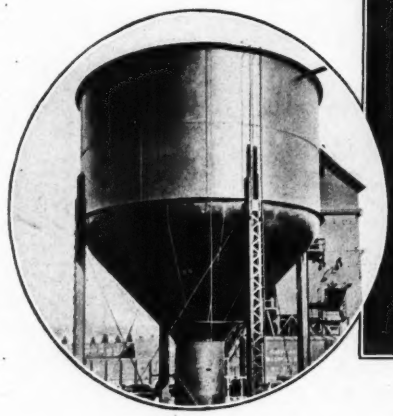

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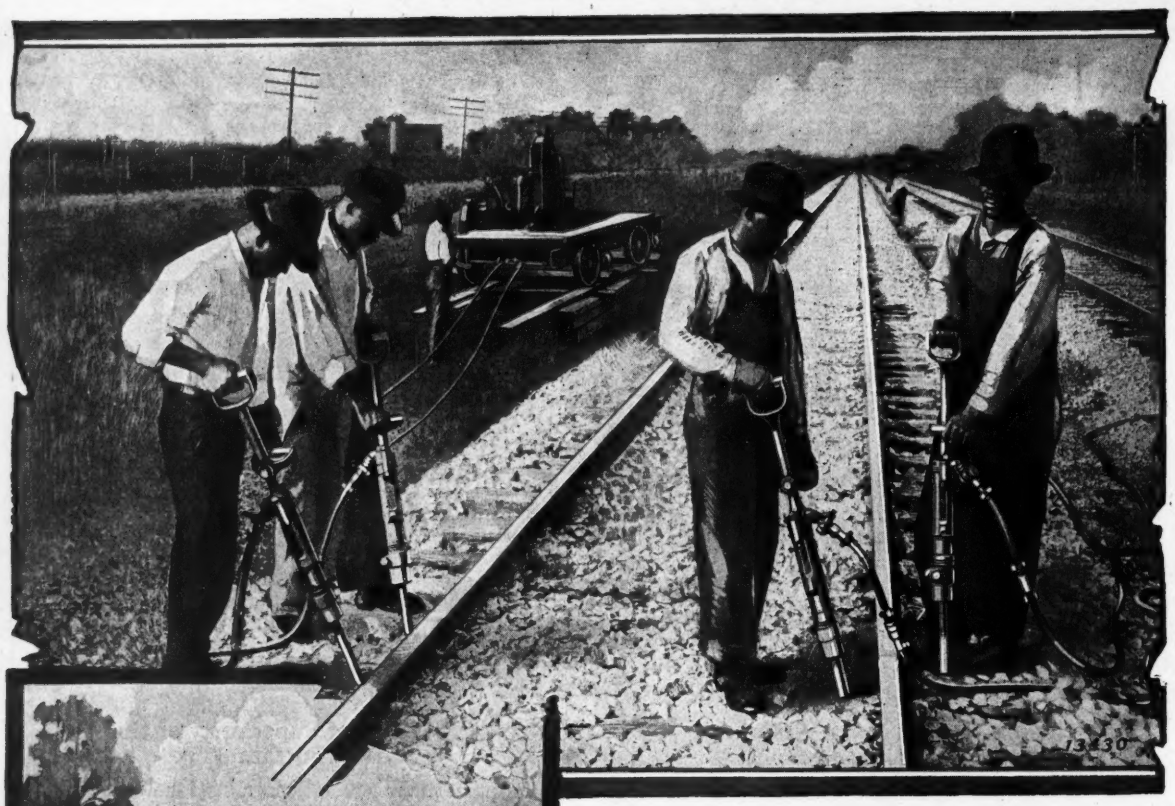

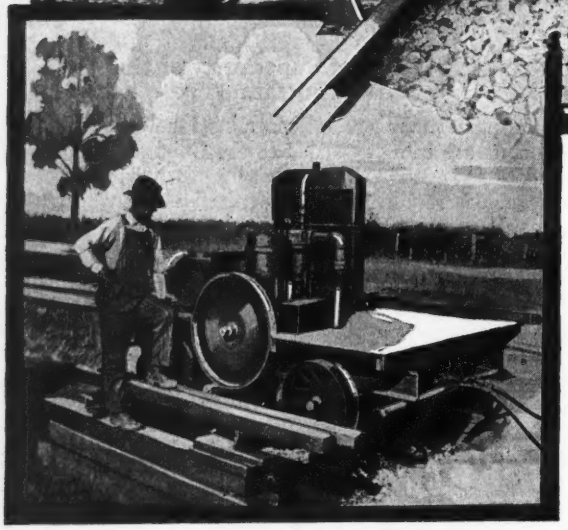

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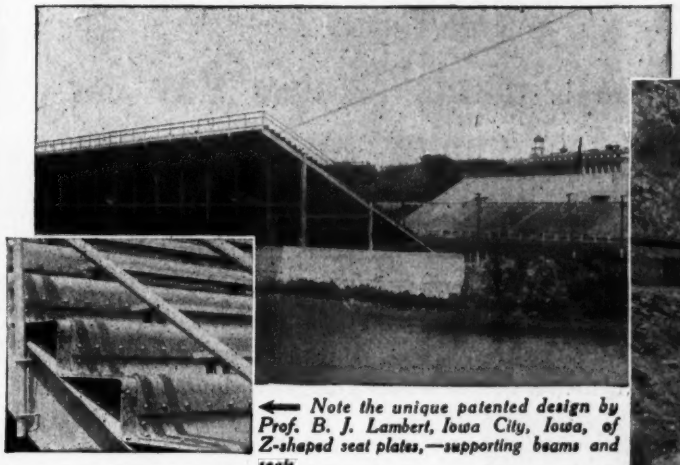
The Lesson for the Culvert User in IOWA'S New Stadium



←New home of Howard Jones' famous football warriors.

← Note the unique patented design by Prof. B. J. Lambert, Iowa City, Iowa, of Z-shaped seat plates,—supporting beams and seats.

-the old section in concrete the new in metal–Why?

In the April 11th, 1923 issue of *The American Architect* appears an interesting article giving details of the new section of the stadium and reasons for the choice of metal. This article is quoted in part below.

Elastic Construction Because of the character of the terrain for the new section (the Iowa River running close along side) a structure that would overhang its support was necessary. Concrete being practically inelastic would not answer.

Permanence "Deterioration in surface finish and cracks due to temperature stresses or improperly designed foundations have been noted in early concrete stadia" (American Architect—page 331) A lasting structure was offered by the new design.

Removability (if necessary). "One of the great advantages of this type of construction lies in the possibility of its ready removal to another site in case it was ever found necessary. In these days of rapid change, it is easy to see that a field and stadium that are adequate now may be entirely inadequate in ten years or so. In such cases the steel stands can be readily taken down and moved, added to or double decked—all with 100% salvage. In the case of reinforced concrete, the salvage is nothing and the expense of wrecking, removal and disposal of waste is considerable." (American Architect, Page 333)

Low Cost The total cost erected at present steel prices is about $6.00 per 18" seat, far lower than concrete.

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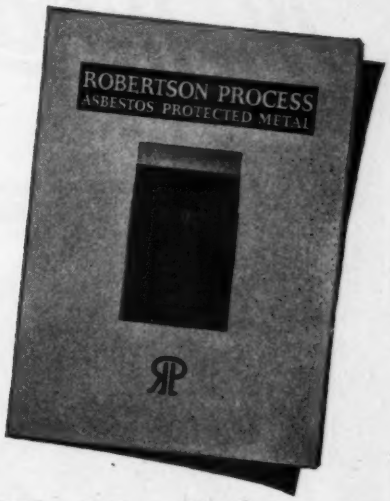
Here Are Two Things You Should Have



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Railway
Engineering and Maintenance

Volume 19 July, 1923 No. 7

COMBINED HIGHWAY AND RAILWAY BRIDGES

THE fire which destroyed a considerable part of the east approach of the Atchison, Topeka & Santa Fe bridge at Fort Madison, Iowa, described in detail elsewhere in this issue, points to a hazard not often discussed. The trestle had a ballast deck, so there was a minimum of danger of fire from locomotive cinders. It stood in water, so there was almost no chance of fire from underneath. But adjacent and intimately attached to the railroad structure was a highway trestle connecting with cantilever roadways supported by the trusses of the river bridge, and all evidence indicates that the fire had its origin in rubbish accumulated on the highway trestle and was communicated from this to the railroad structure. The fire therefore was the result of conditions beyond the control of the railroad.

Similar conditions prevail in almost any other case where wooden railway and highway bridges adjoin. The precautions taken by the railroad to provide construction that offers a minimum fire hazard and to school its employees in the exercise of care to prevent fires may come to naught because of slovenly maintenance methods on the part of the state or county highway officers or carelessness with cigars or cigarettes by the users of the highway bridge. These conditions point to the wisdom of avoiding combinations of railway and highway structures wherever possible.

WORK TRAIN HAZARDS

ON October 10 of last year, a work train on the Atchison, Topeka & Santa Fe collided with another train near Burbank, Okla., killing one man and injuring four. On November 2 a work train on the Florida East Coast met a freight train head on near Everglade, Fla., killing three employees and injuring eleven. On November 14 a work train on the Southern met another train on a high bridge near Sadieville, Ky., killing one man and injuring two others. On December 23 a work train on the Illinois Central collided with a freight engine at Amboy, Ill., killing one and injuring four employees. These four accidents leading to the death of six and the injury of 21 employees were summarized in a single quarterly accident report of the Interstate Commerce Commission for the last three months of 1922. They point to the hazards of work train operation, most of which are incident to maintenance of way work.

While responsibility for the control of work trains, in so far as their operation on main tracks is concerned, rests with the train crews and other supervisory officers in the transportation department, these trains are engaged in the work of the maintenance of way department and those killed and injured, other than members of the train crews, are employees of this department. The crews of these trains take their instructions regarding the work to be done from maintenance officers and in view of the danger of accidents such as those referred to, these officers should so arrange their work as to reduce these hazards to the minimum and to insist that the train crews take no chances which may lead to accident. In each of the instances referred to, one or more employees were at fault.

WHAT ATTENTION ARE YOU GIVING TO YOUR CAMPS?

THE extreme labor shortage with which all industry contended during the three years ending with the signing of the armistice resulted in a general movement to improve the lot of the workman. On the railroads greater progress was made in improved housing and feeding of the transient forces employed in maintenance of way work than in any other period of railroad history While this change may be explained in part by an awakened solicitude for the welfare of the men, the real reason is to be found in the active competition for the available supply of labor. Employers bid against each other, not only in the wages they offered, but also in the facilities they provided for the comfort of the men during the hours of rest and leisure. It is not to be inferred from this that the accommodations were extravagant or out of reason. Instead, it may be said that the railroads and other employers of common labor were forced by circumstances to house and feed their men according to standards demanded by a proper consideration of personal health and comfort.

But in 1919 and again in 1921, industrial depressions resulted in a surplus of labor. Men were no longer able to exercise a preference in employment; they were glad to take any jobs that were offered. So in spite of a general appreciation of the moral or social aspect of the movement for better housing, a removal of the basic necessity for providing "model" camps resulted in some tendencies towards laxness in camp management. A marked reduction in the number of men employed together with the general movement towards the contracting of maintenance of way work during 1921 and 1922 resulted in a large reduction in the number of camps operated under the direct supervision of the maintenance of way officers. Moreover, the ease with which arrangements may be made with boarding contractors to take this responsibility from maintenance of way officers has naturally led to the more general adoption of contract boarding. The net result has been to make the housing and feeding of men, matters of minor importance for the railway officer.

But the past twelve months have seen a marked change in industrial conditions. From a period of general labor surplus we now find ourselves in the throes of an extreme

labor shortage under which men are almost as hard to get as during war times. Consequently the employer of common labor is again confronted with the necessity for considering all factors that influence the attractiveness of employment in his organization. So, while proper consideration for the comfort and health of his men is a responsibility which he should observe at all times, present conditions make it one of positive necessity.

IT APPLIES TO THE RAILWAYS ALSO

THE American Railway Association has formulated a program to secure the maximum service from the equipment available. In the fulfillment of this program the railways are making every effort to secure the maximum service from *every* car. They are eliminating delays in yards and on sidings and industrial tracks. They are speeding up the repair of bad order cars and are adopting other measures designed to reduce to the minimum the delays within their control. They are also working with the shippers to get them to load and unload their cars more promptly and to load cars to capacity. As a result, the railways are now handling from week to week within one per cent of the maximum traffic ever handled in any single week in any previous year without any car shortage—a condition never experienced before during a period of heavy traffic.

If it is good practice to urge a shipper to load his cars heavily and particularly to release them quickly, it is even better practice for the railways to insist that their employees use with equal efficiency the equipment required to handle company materials. The least that they should do is to set an example for their patrons. Supervisors and division engineers can afford to check daily all cars on hand on their territories loaded with company materials and to take such measures as may be necessary to secure their release. In the same manner, the foremen should give preferred attention to the unloading of cars with material consigned to them. It may frequently be more convenient and possibly more economical to delay the unloading of cars for a few days, perhaps until a sufficient number accumulate to justify the ordering of a work train, but if these delays are incurred at many points on a system the net result will be to hold a considerable number of cars out of service.

If shippers are willing to pay their employees overtime for working additional extra hours to release cars, the railways can be no less active in this direction. If maintenance of way officers in common with shippers are to secure the cars which they require for the handling of their materials during the next few months, it will be necessary for them to co-operate in promoting the maximum utilization of each individual car for it will be only as these individual cars are utilized to the best advantage that the movement of all of them will be increased sufficiently to meet the demand.

WHEN THE FULL COST IS CONSIDERED

THE railways give much attention to the allocation of new and second-hand rail in order that it may be laid where it will best meet the demands of traffic and render the maximum service. They prepare detailed specifications for their track fastenings and subject them to thorough inspection at the mills to insure that they are securing the necessary quality. They are also giving much attention to the reclamation of materials released from service to place them in a condition for further use or to fit them for sale at the best price. These are important measures, which should be maintained and strengthened and are typical of the care with which the railways are making most of their expenditures for engineering and maintenance of way materials. However, important as these measures are, they are secondary measured in the volume of savings possible, to that which may be attained with similarly careful attention to the selection of ties. As has been stated previously in these columns, more money is expended for ties than for rails and all other track fastenings. Yet they are being purchased today with almost complete disregard of the safeguards thrown about other materials.

A few roads have drafted and are now enforcing rigid specifications for their ties. Conspicuous among these roads is the Atchison, Topeka & Santa Fe, which is securing a life from its ties twice the average of other roads. Because of this fact, its tie requirements are, of course, reduced accordingly and the savings effected accrue to the maintenance accounts and to this department.

The tie situation is particularly acute at the present time, as pointed out elsewhere in this issue. The seriousness of this situation is not confined to the money now being spent for ties of inferior grade, but will be reflected in the cost of maintenance during the next several years when these ties are coming out of the track. Hundreds of thousands of ties are being purchased which are admittedly too small to give the proper service and almost equal numbers are being accepted in which decay is present. These ties cannot be expected to render adequate service and their life will be short. A serious phase of this situation arises from the fact that the loss is not confined to the money invested in the materials alone, for it involves correspondingly heavy expenditures for labor to remove the ties prematurely, while much of the money spent for the treatment of these inferior ties will yield little or no return.

While the present chaotic situation in the tie producing

THE FOREMAN

The railroads have grown so fast and the organizations have become so large that the foremen and subordinate officers hold a strategic position. In many cases, they are the only links between the management and the men and, in the eyes of the men, stand for the management.

Sherman Rogers in his book, "Foremen! Spark Plugs or Grounded Wires," makes this statement: "The efficiency of a man is either raised or lowered from 15 to 50 deg. by his mental attitude toward the job, by his mental attitude toward the company and by his mental attitude toward the foreman he is working under. Therefore, the foreman, having practical experience, is going to learn how to pull every ounce of spirit out of a man by becoming thoroughly familiar with the peculiarities of every individual under his direction. * * * The foreman of the future who is not a good reader of character, who hasn't a feeling of respect and admiration for men as a whole, who has not a pleasing personality—will find his job limited to a mighty small sphere. Foremen of the future who desire to advance will find that the development of personality and ability to sell confidence, good will and respect to men will be a lot bigger factor in bringing an increased pay check and a higher position of authority, than ability to 'drive' men for a short period of time."

fields may disappear within a few months, the results will continue to be reflected in maintenance of way charges until these ties have been removed from the track. Although the present situation is not unusual and is probably no more pronounced than has existed previously in times of similarly heavy demand, it is now so acute and is so evident that it warrants careful investigation in order that proper measures may be taken to forestall its recurrence when the demand for ties again exceeds the supply. This is not a problem primarily of the purchasing department any more than is the quality of rails. Rather, engineering and maintenance officers must take the initiative in fixing the standards of ties which they desire (which they have already done through their general acceptance of the American Railway Engineering Association specifications for ties), and by insisting that the ties purchased for them comply with these specifications.

HE WHO WORKS EFFICIENTLY DOES NOT NECESSARILY WORK HARDER

TO MANY men the term efficiency implies some sort of a driving system under which the men are pushed to the limit of their energy and the foremen are harassed by constant pressure from their superior officers to increase the output of their gangs. This impression is erroneous, for efforts to obtain greater economy or increase output of work through such means cannot be successful permanently. They are sure to result in a sullen or defiant spirit on the part of the men, which will neutralize the results of such driving methods, particularly in times of labor shortage.

True efficiency, whether it concerns the individual, the gang or the entire organization, is obtained primarily through the practice of economy in utilizing the time and efforts of the men. Under efficient management men do not work harder but their work is programmed so that there is always something for them to do, their work is applied to some useful purpose at all times and the methods they follow in doing the work are such as to get the desired result with the least effort.

The maintenance of way foreman who does not plan his work thoroughly will take more of the time of his gang in riding over the section, in loading and unloading tools, in telling his men what he wants done, in handling material, in extra trips to the tool house, or a dozen other wasteful operations, but except in so far as his men stand around idle while he is deciding what to do next, they will work as hard or harder than those in the gang run by the efficient foreman who has prepared a complete program for the day or for several days ahead.

Efficiency is accomplished in other ways that do not affect the amount of effort exerted by the laborers. It is gained by assigning each class of work to the man best fitted to do it, by having the roughest and heaviest work done by the man who has the least skill, by giving the closest supervision to the men that need watching, by teaching men to handle their tools and their bodies so that they get the necessary results with the least effort, by dividing the work so that no man needs to wait until another has finished his part.

But true efficiency cannot be obtained unless the efforts to obtain it go beyond the foremen. No gang leader can obtain the desired results from his own efforts unless he has the cooperation of his superior officers. In general, such plans as he makes for his work must be prepared with the general advice and counsel of these officers, but having made them he should be given a fair chance to work them out according to his own resources.

Letters to the Editor

MOTOR CARS SAVE TIME OF SIGN PAINTERS

Carbondale, Ill.

TO THE EDITOR:

The motor car has practically revolutionized the painting of track signs. A crew of four or five men with a motor car will do as much as six or eight men on a hand car. No crew on a railroad will pay for a motor car quicker than a small gang painting track signs. The work is nearly always done by painting the posts and signs white, and running back to stencil on the letters. The white is usually white lead, linseed oil and turpentine, because proprietary paints must have "extenders" in them and are necessarily not as opaque as white lead for outside work. One coat of white lead is usually sufficient, except where standards are changed and the lettering or stenciling is different.

The scaffolding required is small and simple, two ladders and possibly ladder jacks and a plank. After several years of experimenting with metal stencils, of all kinds, and the tough manila stencil paper, we have found paper stencils the best, especially large ones which consist of two stencils glued together and framed with one-inch by one-inch square sticks to which the stencil is fastened with carpet tacks.

A good practice is to write the number of the post in the fresh paint on the back of a mile post with a blue pencil so it will not be lost when the gang comes back to stencil it. Some prefer to have a second crew follow the "coating out" gang to do the stenciling, but this requires two motor cars, and a second foreman. There is also more liability of error in stenciling the number back on the post.

H. J. BARKLEY,
Master Painter, Illinois Central.

THE SECTION FOREMAN'S POSITION

Seattle, Wash.

TO THE EDITOR:

I think that we should start a campaign to interest young men in track work, pointing out to them the advantages of a section foreman's position in comparison with those available in other lines of activity. We should call his attention to the apprenticeship which he must serve before becoming a machinist and the length of time required before he can become qualified to become a locomotive engineer, signal maintainer or a freight conductor. The opportunities for advancement from laborer to foreman are more rapid in track work, while the employment is more steady and the remuneration greater than in many other occupations. A foreman's pay is $108.16 per month at present for an eight-hour day, with additional pay for overtime, with a house furnished free, or at a nominal rate in many instances, with right-of-way for garden, combined with the fact that he is home every night and for almost every meal.

His position is one of esteem in the community in which he resides, his work is one of the most healthful occupations, being always in the open, and is less hazardous than many in railway service. Opportunities for advancement are good for the man who sets out to excel. For the man who says 'Come on, men," and is willing to take part in the work, there is a future which is worthy of consideration and maintenance officers can do much to improve the personnel of their forces by bringing these facts to the attention of likely young men along their lines.

J. J. HESS,
General Roadmaster, Great Northern.

Lax Inspection Threatens to Demoralize Tie Production

Uniform Grading Necessary to Stabilize Output and Curb Present Destructive Competition

DO THE RAILWAYS desire good ties? It goes without saying that they do. Yet many of them are now permitting and in some cases openly encouraging practices which are defeating this objective. Since the railroads consume almost the entire output of ties they must of necessity pay the full cost of production, including any practices which add to the expense, either directly or indirectly. They have a direct incentive, therefore, to refrain from any practices which will demoralize the production of ties, reduce their quality or contribute in any other way to increased costs. In spite of this interest, the methods under which ties are now being purchased are adding many millions of dollars to their first cost as well as to their ultimate cost by reason of the poorer quality which is being accepted and the shorter life which will therefore be secured from them. These practices, which it is within the control of the roads to correct, are so pronounced at the present time that they demand special consideration. For this reason, a member of the editorial staff of *Railway Engineering and Maintenance* has made an extended investigation of conditions in the areas in which the major portion of the country's supply of ties is being produced, in the belief that a statement of the practices which now prevail in these areas will make the objections to them so self-evident as to lead to their correction.

These conditions grow out of the fact that the tie producing industry has long suffered from wide fluctuations in the number of ties purchased by the roads. Although the deterioration of ties in service is relatively uniform, the time when they should come out is to some extent a matter of judgment and there is usually a sufficient factor of safety to permit the number to be renewed in any season to be varied to a considerable extent. As a result, tie renewals have been permitted to fluctuate more directly with the earnings of the roads than sound maintenance practices would dictate. Furthermore, many of the roads have usually postponed their purchases until the last minute and have then rushed into the market for quantities greater than could be produced quickly. The result has been to create alternate periods of heavy and light demand. When the roads are actively after ties, they compete with each other, running the prices up in an effort to stimulate demand and permitting deviations from specifications to increase the number accepted. The result has been to lower the average quality of the ties by accepting those of inferior grades and thereby encouraging their production.

Uniform Specification Not Enough

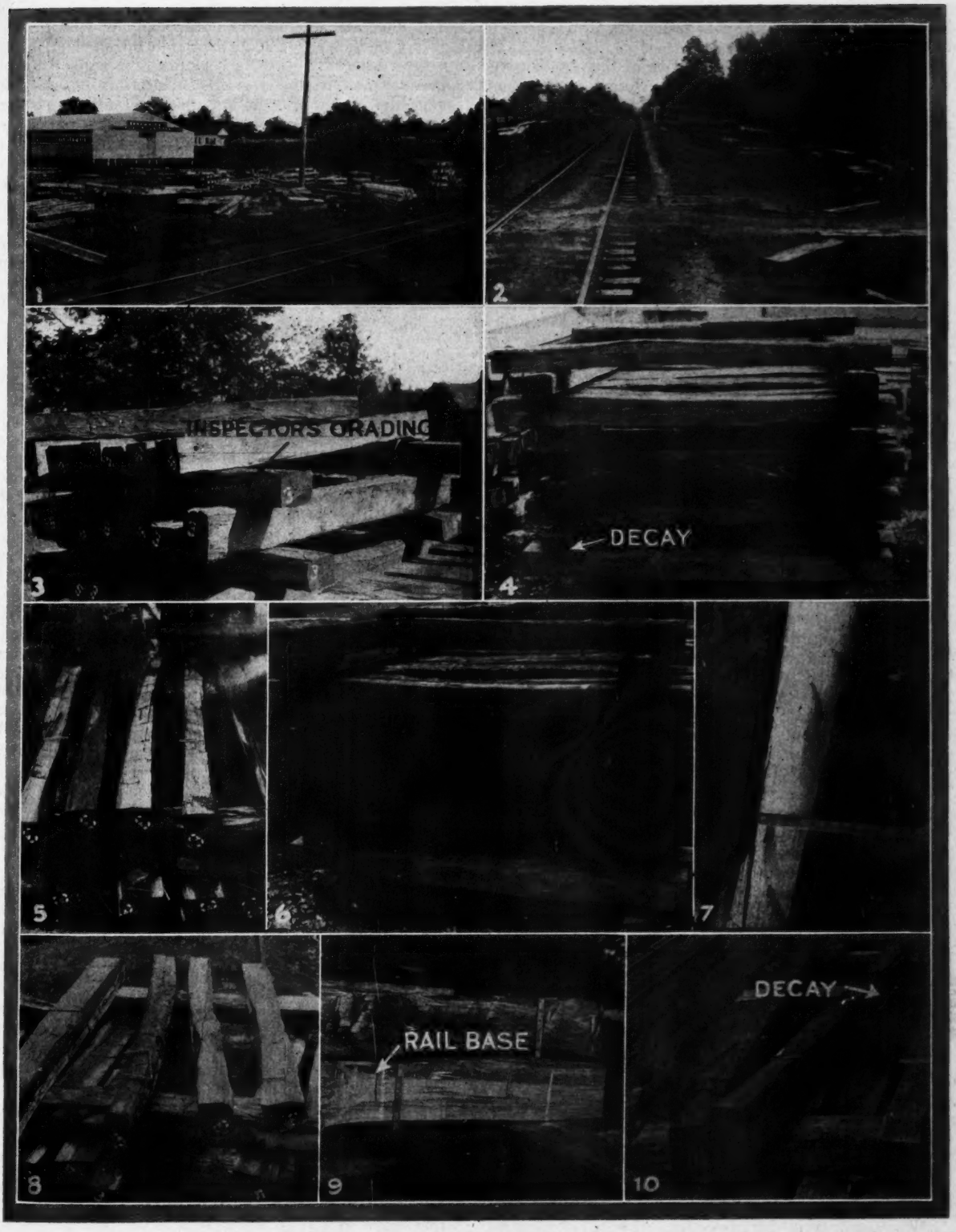
Following the quite general adoption by the roads of the American Railway Engineering Association specifications for cross ties, it was felt by many railway men that the problem of securing a satisfactory supply of ties of the proper grades was solved. However, they overlooked the fact that a specification is only as good as the inspection which is instituted to enforce its provisions. As a result the conditions which are now prevailing in the purchase of ties differ little from those which have existed previously in times of excessive demand. Investigations extending over the principal tie producing areas of the United States, supplemented by visits to the woods, and the examination of thousands of freshly cut ties, show that the same objectionable conditions prevail in most areas and are not confined to any one locality. Conditions this year differ from those of past years only to the extent that more roads and purchasers than formerly are adhering closely to the intent of the specifications than in past years. They are, however, encountering much difficulty in securing the desired number of ties because of the fact that a much larger number of roads and producers are not now enforcing the specifications.

As in the past, the withdrawal of the roads from the market in 1921 and early in 1922 resulted in the reduction in the price paid for those ties produced and this, in turn, led to the curtailment of production. Without an outlet for their ties, many producers turned to other work. During this time the specifications were enforced rigidly by most of the roads in their attempt to select the better grades of the ties available and to reject the remainder. While some of the tie producing companies had sufficient financial resources to continue production and store ties until the roads returned to the market, few have been willing to take the chance because of uncertainty regarding the nature of the inspection to which their ties would be subjected. As a result, when the roads entered the market for ties last fall, they found disorganization among the tie producers and small reserve stocks. Before the producers could organize their forces and increase their production, the roads had come into the market in such numbers and for such large quantities of ties that the demand far exceeded the supply. As a result, prices rose rapidly and, even more serious, there has developed a general laxity in the enforcement of the specifications, resulting in the acceptance of ties which failed to comply with the specifications for the grades indicated. These conditions have grown steadily worse and the market has become seriously demoralized by the deviations from standards, which have become so pronounced in many localities that the specifications exist in name only. In fact, in an effort to secure the *number* of ties, certain roads have waived their specifications entirely and have accepted contractor's gradings without a guarantee of protection of any kind.

Overgrading Is Prevalent

The deviations from the specifications may be grouped into two principle classes. The most common is the practice of over grading ties or accepting them for grades higher than their size warrants. A second abuse is the acceptance of ties in which decay is clearly evident.

As to size, the specifications are clear and exact. They fix the minimum dimensions of each grade of ties, sawed and hewn. Thus, a grade 5 tie should be 7 in. by 9 in. in cross section and a grade 3 tie, 6 in. by 8 in., hewn or sawed, or 7 in. by 7 in. hewn. These measurements are capable of checking, yet overgrading is so pronounced in practically every large tie producing area as to make it very difficult to secure any large num-



Overgrading Is Pronounced in Many Areas

1. Several company's compete for ties at most points. 2. A typical tie yard adjacent to a railway. 3. A typical example of overgrading which increased the cost of this pile over $12. 4. A pile of 45 ties accepted as 35 grade 3, and 10 grade 2, which accurate inspection showed to grade 15 culls, 15 rejects, 5 grade 1, 7 grade 2, and 3 grade 3. 5. Ties 4½ in. thick accepted as grade 3's. Fifty per cent of more than 7,000 ties in this yard were overgraded. 6. A pile with numerous overgraded and decayed ties, typical of more than 15,000 ties in this yard. 7. A tie 3¾ in. thick accepted as grade 3, typical of a considerable number in this yard. 8. Ties less than 5 in. thick accepted as grade 3. Note split extending almost entirely across second tie from right. 9. Tie 5 in. thick at rail base, accepted as grade 3, typical of conditions found in 5,000 ties in one yard. 10. Three ties from top of pile in one yard, all of which were less than 5 in. thick and one badly decayed, accepted as grade 3.

ber of ties by those roads and producers which are adhering to these specifications.

This condition is illustrated by one of the photographs showing a pile of 35 ties which were accepted and graded by the railroad inspector as 17 grade 3 (6 in. by 8 in.) and 18 grade 5 (7 in. by 9 in.) ties, whereas accurate grading showed them to be 7 rejects (5½ in. by 7 in.), 7 grade 3 (6 in. by 8 in.), 6 grade 4 (7 in. by 8 in.) and 14 grade 5 (7in. by 9 in.) ties. In this yard a comparison of the grading of the inspector with an accurate grading in accordance with a correct interpretation of American Railway Engineering Association specifications under which the ties were being bought showed that the road was paying a premium of $12.30 per pile. In this same yard many ties rejected by certain purchasers because of their failure to comply with the specifications and bearing their reject marks were accepted by other producers and graded for all grades up to and including No. 5, the best grade recognized by the specifications.

In another instance, a pile of 36 ties accepted by the chief inspector of a road as 26 grade 3 and 10 grade 5 should have been classified as 12 rejects, 9 grade 3, 3 grade 4 and 12 grade 5. At still another point, a pile of 17 ties was graded as 16 grade 3 and 1 grade 5, although 12 of them were so badly shattered as to make it questionable whether they were worth inserting in the track.

The overgrading of ties which are too thin to comply with the specifications for even rejects is particularly pronounced in many areas. The specifications fix the minimum size of the smallest standard or grade 1 tie as 6 in. by 8 in., although they permit the acceptance of ties with a minimum thickness of 5½ in. at the rail base as serviceable rejects. One of the photographs shows a tie only 5 in. thick at the rail bearing or one-half inch less than that permitted as a reject yet graded as a No. 3. This is typical of the grading given a large proportion of the more than 5,000 ties in one yard visited in which the ties were inspected only a few days prior to the making of the photograph. In another instance in this vicinity, more than 3,000 ties rejected by one producer for failure to comply with the specifications for any grade and bearing his reject marks were shipped to a large eastern road as grade 3's. This condition has become so pronounced in some areas that the tie makers have asked tie contractors to mark only those ties which are accepted, as a reject mark interferes with their sale to some other buyers.

Even more pronounced was an instance observed with sawed ties where all of these ties had been sawed accurately to dimensions of 6 in. by 8 in. (A. R. E. A. grade 3), yet were accepted promiscuously as grade 3 and grade 5, although of identical size and piled side by side. Over 5,000 such ties were graded in this manner in one yard. In another yard producing largely red oak ties of which there were 7,000 awaiting shipment, a check inspection revealed at least 50 per cent to be overgraded one to two grades and many accepted with defects which should have led to their rejection for any grade.

With such laxity in inspection, it is to be expected that restrictions regarding manufacture will be equally lax. Thus, one photograph illustrates ties accepted as No. 5's (the best grade recognized by the specifications), although when adzed to produce a proper rail bearing, their depth will be reduced to such an extent that they will barely comply with grade 3, and they are typical of hundreds in this yard. Likewise, many ties with excessive wane are accepted above what they will measure when squared up.

The effect of accepting ties as complying with grades higher than those to which they rightfully belong is to raise the price. Thus, the acceptance of a grade 3 tie as a grade 5 and paying a grade 5 price for it does not change the size of the tie, but merely results in paying a grade 5 price for a grade 3 tie. The effect of this is indicated by a check which was made of a pile of 34 white oak ties taken up by a contractor for a central western road as 1 reject, 2 grade 1, 2 grade 2, 13 grade 3, 2 grade 4 and 14 grade 5 ties, whereas the accurate application of the A. R. E. A. specifications would have culled eight ties and accepted the rest as 16 grade 1, 1 grade 2, 5 grade 3, 2 grade 4 and 2 grade 5 ties. The overgrading of this pile by the contractor was equivalent to increasing the prevailing prices for that pile 21 cents per tie.

Many Decayed Ties Being Accepted

Of equal seriousness is the laxity of inspection as regards decay. It is commonly recognized that the presence of decay in a tie reduces its service life and its value, yet thousands of ties which have lain in the woods or tie yards for months and even years have been accepted recently even when it was known that their life would be greatly curtailed. Likewise, decay in ties cut more recently is being ignored, as is evidenced by the photographs of representative ties taken in yards over a wide area. In some yards visited over half of the ties were either decayed or much overgraded. In certain areas much of the oak timber now being cut into ties is diseased and the ties are thus decayed when cut. While these ties are being rejected on this account by some roads, they are being accepted freely by others. As a result, the woodsmen are cutting this timber in large quantities while they can find a market for it. Although this form of deterioration is readily apparent in the untreated tie, as is shown by the outlines in chalk in several of the photographs, it is not so apparent after the ties have been treated. As an indication of the prevalence of this difficulty, 3,000 ties rejected by one producer at a single station were accepted and graded by another without any penalty for this decay, a practice which is being duplicated at many points.

While one cannot deny any road the privilege of buying any grade of ties which it desires and of classifying them as it sees fit, the difficulty arises from the fact that the influence of such action is not confined to the road in question but extends to all other roads buying in this area. This is particularly true in those sections where the ties are produced in small quantities by woodsmen who bring them to the nearest shipping point and sell them to the highest bidder. In most instances, buyers for several companies compete for these ties and in times such as these when the companies are forced to meet each other's prices grade for grade, that company which practices the most liberal grading is in effect paying the highest price and secures the ties. The effect on the tie contractor, who grades strictly according to the specifications, is to curtail his purchases to the point where he in turn is unable to fill the requisitions of those roads who desire specification ties. Thus, one prominent eastern road, which buys its ties in the southeast and which has adhered rigidly to the specifications, has found its supply practically shut off because of the fact that other roads buying in this territory are accepting freely as graded ties those which it has refused to accept even as rejects. In another instance, a large road tapping one of the largest producing areas in the southwest, which has been buying according to specifications, has been forced to suspend purchases along portions of its own lines because of the demoralization which has been introduced by con-

Evidences of Decay Are Common

1. Half of the ties in this pile are seriously decayed. 2. A pile of badly decayed and undersize ties with grades for which they were accepted indicated in white. 3. Half of the ties in this yard were decayed or undersize. 4. Decay removed from large knot under rail base and piled on top of tie. This tie was accepted for grade 5. 5. Pocket knife imbedded in decay under rail base of tie accepted as grade 3 within a week prior to taking of photograph. 6. Chalk marks indicate extent of visible decay in ends of ties. Rule indicates tie 4¾ in. thick at rail base accepted as grade 3. 7. Tie decayed for half its length and with rotten wood torn loose accepted as grade 5. 8. Poorly manufactured ties accepted as grade 5, although less than 6 in. thick. 9. Excessive wane is evidenced in many poorly manufactured ties.

tractors acting for other roads who are overgrading the ties to such an extent as to make the specifications of little value.

Roads Suffer from These Practices

Such practices result to the detriment of the roads as a whole in several ways. In the first place, they are encouraging the production of many ties of inferior grade which will not yield adequate service and will, of necessity, increase the cost of track maintenance. Furthermore, the classification of a tie as of a grade to which it does not belong demoralizes the industry and prevents the roads which desire ties adhering to specifications from securing them. On the other hand, if all of the roads would adhere literally to the specifications which they have adopted, the woodsmen would cut ties which would conform to those specifications, the production of inferior ties would be discouraged and the production of specification ties would be stimulated by the payment openly of prices which are now being paid through subterfuge and overgrading.

This condition, which is as old as the tie producing industry, points to the necessity for the enforcement of the uniform specifications with a uniform inspection which will be fair alike to consumer and to producer and which will be enforced uniformly in times of heavy as well as of slack demand. An inspection of this character, enforced by all roads purchasing in a given area, would insure the maintenance of standards of quality, production being stimulated by increasing the price sufficiently to bring out the ties. With a uniform inspection a tie producer could proceed to cut and to treat ties during periods of slack demand when prices were low.

Labor Board Considers Wage Rate Change

AFTER receiving arguments from both the railroads and the employees in a case involving demands for increases in wages for maintenance of way employees, the Labor Board closed its hearing on June 13 and remanded the disputes to the roads, on June 28, and their employees with the suggestion that "exhaustive efforts be made to reach amicable agreements, attention being given to the settlements already made on many roads." As stated briefly in last month's issue, this case involved a plea on the part of the Brotherhood of Maintenance of Way Employees and Railway Shop Laborers for wage increases ranging from 8½ to 15 cents. Some 24 railroads in the west and southwest were concerned in the case, the list of roads involved as given in last month's issue being reduced by the withdrawal of 11 railroads which subsequently concluded agreements with their employees in which certain increases in wages have been granted. These railroads are: the Chicago & North Western; the Chicago, Rock Island & Pacific; the Chicago, St. Paul, Minneapolis & Omaha; the Cincinnati, Indianapolis & Western; the Duluth, South Shore & Atlantic; the Illinois Central; the Kansas Oklahoma & Gulf; the Minneapolis & St. Louis; the Minneapolis, St. Paul & Sault Ste. Marie; the Minnesota & International; the Missouri Pacific; the Northern Pacific; and the San Antonio & Aransas Pass.

The argument presented by the brotherhood followed the same general line presented in previous hearings before the board, namely, a plea for the living wage as approved by the Bureau of Labor Statistics of the Department of Labor. The reasons for a definite recognition of the "living wage" were presented at length.

The railroad managements contended that no increases were necessary at this time and pointed to the fact that the advances proposed by the brotherhood were out of line with those actually put into effect on those railroads which have arrived at agreements with their men. Particular attention was drawn to the relation of wages to the cost of living in the various localities and to the fact that in the agreements between the various railroads and their employees, there is a wide diversity in the amounts of the increase granted.

Further Advances in Wages

Supplementing the advances given by the railroads to their maintenance of way employees as tabulated in *Railway Engineering and Maintenance* for June, other railroads have announced increases for their employees. The following is a statement of advances given by 19 other railroads in summary form, no attempt being made to note all of the exceptions or deviations from the general rule. Amounts given in dollars apply to the monthly rate, those in cents to the hourly rate.

Foremen of mechanics in the maintenance of way department received an increase of 2½ cents on the C. R. I. & P., $3.40 on the C. & A., $5 on the B. & O. C. T., the Gulf Coast Lines, the I. C., and the S. A. & A. P., $10 on the M. & I., the M. & St. L., the M. P., and the N. P. Minimum rates have been established on the C. & N. W. of $172.50, and on the C. M. & St. P. of $160.

Assistant foremen of mechanics received advances of 1 cent on the B. & O. C. T., 2 cents on the C. & N. W., and the S. A. & A. P., 2½ cents on the C. M. & St. P., and the C. R. I. & P., 3 cents on the M. P., 3¼ cents on the M. & St. L., 5 cents on the I. C., $3.40 on the C. & A., $10 on the M. & I., and the N. P. Those on the D. S. S. & A., and on the M. St. P. & S. S. M. receive 5 cents more than the mechanics.

Section foremen received advances of $5 on the B. & O. C. T., $4.80 on the C. & A., $5 on the C. & N. W., $2.04 on the C. M. & St. P., and the C. R. I. & P., $5.84 on the D. S. S. & A., $4.34 to $4.84 on the Gulf Coast Lines, $5 on the I. C., $6.84 on the M. & I., $5.84 to $7.48 on the M. & St. L., $5.80 on the M. P., $5.84 on the M. St. P. & S. S. M., $6.84 on the N. P., and $5 on the S. A. & A. P.

Extra gang foremen received an increase of $6.80 on the C. & A., $3.84 on the Gulf Coast Lines, and $5 on the C. & N. W.

Assistant section foremen received an increase of 3 cents on the B. & O. C. T., 2½ cents on the C. M. & St. P., and the C. R. I. & P., 1 cent on the M. & St. L., and 2 cents on the S. A. & A. P.

Mechanics in the maintenance of way department received increases on the B. & O. C. T. of 2 cents for carpenters and 1 cent for painters, 2½ cents on the C. M. & St. P., 2 cents on the C. R. I. & P., the Gulf Coast Lines, the S. A. & A. P., and the C. & N. W., from 1½ to 2¼ cents on the M. & St. L., 3 cents on the C. & A., the I. C., and the M. P., 3¼ cents on the M. & I., and the N. P., and 4 cents on the D. S. S. & A., and the M. St. P. & S. S. M.

Mechanics' helpers were given 1 cent on the B. & O. C. T., the C. M. & St. P., the C. R. I. & P., the Gulf Coast Lines, the M. & I., the M. P., the N. P., the S. A. & A. P., the I. C., and the C. & N. W., and 3 cents on the D. S. S. & A., and the M. St. P. S. S. M.

Track laborers were given 1 cent on the C. M. & St. P., the C. R. I. & P., the Gulf Coast Lines, the M. & St. L., the C. & N. W., and the U. P., 2 cents on the C. & A., the L. & A., the M. & I., the M. P., and the N. P., from 1 to 2 cents on the D. S. S. & A., and the M. St. P. & S. S. M., from 1 to 3 cents on the S. A. & A. P.

Why I Think American Railroads Offer the Greatest Opportunities

William W. K. Sparrow Tells Why He Gave Up His Position With the Government Roads of South Africa to Begin Anew in This Country

By WALTER S. LACHER

"DID YOU ever hear of a letter carrier or a railway mail clerk who became postmaster general? Do you know of any group of men who have fewer opportunities for advancement? It is my observation that the employee of a government-owned railroad has no more opportunity for development or expression of his individuality and initiative or to gain promotion by hard work and ability than the men in our postal service."

This was the answer I received from William W. K. Sparrow, vice-president of the Chicago, Milwaukee & St. Paul, in charge of accounting, financial and real estate departments, when I asked him to tell of his experience with the South African railways.

"I hope that we never have government ownership in this country," he continued, "because it would put me in the position of having 'jumped from the frying pan into the fire.' I gave up a ten-year service record in South Africa to begin all over again in this country for no other reason than to get away from government-owned railroads. Unless a man has had an experience similar to mine, he will find it hard to realize the repressive influence of government service, the restriction it places upon self-development and expression and its destructive effect upon a man's incentive and ambition and his God-given desire to work out his own ideas, do his own thinking and accomplish something constructive and worth while. A man there might spend long hours trying to figure out how he could save 100 cu. yd. of concrete in the building of a culvert, but after he has learned how utterly impossible it is to secure even the smallest modification from the plan sent out from the general office, he will probably think twice before he offers any more suggestions. If he does not and persists he will probably find himself regarded as something of a nuisance and a disturber of well-established rules and principles.

"It was interesting to watch the effect of the system on the men in the service—I mean those who had ambition and took an interest in their work. Some of them stood up under it longer than others, but it always broke their hearts in the end. A fellow will rebel at the start, but he learns eventually that he must submit to it or get out. It works like the method they use on the 'niggers' or kaffirs they employ for common labor. Whenever one of these fellows refuses to work or 'soldiers' on the job, the foreman picks him out of the gang and says, 'Here, pick up this rock and carry it over there. Now, take it back and put it where you got it,' and so on for several hours. The rest of the gang, of course, gets the idea and 'jollies' the poor fellow while he goes on with his endless and meaningless task, and by the end of perhaps half a day he realizes he is up against it and is willing to go back into the gang and do his share of the work.

William W. K. Sparrow
Vice-President, Chicago, Milwaukee & St. Paul

"I do not mean by this that all men in government service are unhappy. As a matter of fact, it is an almost ideal arrangement for the fellow who wants to get along with the least amount of work. He knows that he is secure in his job so long as he does just enough to get by and, of course, such a man isn't much concerned because his chance for advancement is practically zero. But it is no place for a man who has some ideas of his own and really wants to get ahead."

"But what do you consider is the reason for this?"

"It is the system. To eliminate all opportunity for nepotism, favoritism, or political influence, all positions are under civil service, requiring strict adherence to seniority rules for advancement. It is, to some extent, the same in government service in this country, and, to my mind, is the only practicable method where there is a constant pressure to provide jobs for friends and relatives of politicians or persons in the service. But you can realize what this means to the man who is ambitious. He knows that he cannot be promoted until the man ahead of him advances, dies, resigns or suffers discharge. But the last contingency is exceedingly small in South Africa, because it requires the action of both Houses of

Parliament to remove a man. Outright dishonesty, serious violation of rules or drunkenness are practically the only charges that will result in dismissal. Inefficiency, incompetence or laziness are rarely sufficient cause for action."

"Do you mean that an officer has no discretion in the selection of an assistant for some assignment requiring particular ability?"

"He has to choose men from the list supplied him by the civil service board, which means that in many cases he has to take men of whom he knows nothing. He may, perhaps, reject two or three on the list, but the choice is exceedingly limited. You see very readily how exasperating is his position with respect to any subordinate who shirks in his work. So long as the fellow makes a pretense of doing his duty and avoids outright insubordination, there is nothing the superior can do to get rid of him. Imagine the predicament of a superintendent who is not getting as good results as another division, or the construction engineer who finds that the work on one residency is not getting on as it should. The very fact that the train dispatcher, yardmaster or resident engineer is not responsible directly to his superior for his position would obviously interfere very seriously with any pressure which he might exert in an effort to get better results."

"The obvious question is how you happened to go to South Africa."

"Just a boy's desire for adventure. I was nineteen when I landed at Capetown, fresh from Ireland, where I had worked in an engineering department of the Belfast & Northern County Railway. I was given a temporary position as field engineer on construction surveys and for the next ten years I was employed in some branch of the engineering service, including location, construction and maintenance. When I left South Africa I was an assistant division engineer.

"I stood it as long as I could, but I finally made up my mind that it would take a Napoleon or a Mussolini to change the system and that the only way in which it could be changed would be to smash it. This opinion was confirmed most emphatically in a remark made to me by Thomas S. McEwen, general manager. When he heard that I was going to leave he wired me to come to his office and after I told him why I was leaving he tried to show me in a friendly way why the system could not be changed. 'You are just a piece of gravel in the machine,' he explained, 'and while you may jar it, it will grind you up and go on just as before.' But I told him that it wouldn't because I was going to get out before it did."

"Your determination to leave South Africa must have involved a measurable sacrifice and, no doubt, led to serious hardship after you arrived in America?"

"It was a big undertaking, I'll admit. My wife and I left Capetown in January, 1909, on our wedding day, with fifteen hundred dollars as working capital. Neither of us was acquainted with anyone in America and I knew something of only one man, Dr. J. A. L. Waddell, consulting bridge engineer of Kansas City, some of whose books I had read, and as Kansas City meant as much to me as any other place in the United States, I decided to go there and present my case to Dr. Waddell, hoping that the fact that I had come all the way from South Africa to see him would make a sufficient impression so that he would give me work in his office. Well, that is the way it turned out. I was given a place in his drafting room at fifty dollars a month."

"The fact that I had had no training in bridge design was, of course, a serious handicap, and I found myself assigned to tracing work to which I strenuously objected, stating that I had not traveled ten thousand miles to learn tracing which one could learn even in government service. As a result I was given considerable work that was too heavy for me so I hired one of the men in the office to tutor me one or two nights a week, for which I paid him ten dollars a month out of my fifty.

"The remaining forty dollars wasn't very much for us to live on even in those days so our fifteen hundred dollars capital was soon used up and we had to go into debt. In the course of time, I received some advances in pay and after four and one-half years I was assistant designing engineer."

"It may seem inconsistent after explaining to you how I came all the way from Africa and put up with a lot of hardships to get out of government service to tell you that my next position was with a government organization, the Missouri Public Utilities Commission. I was dissatisfied with my position as a bridge designer because of the limited outlook it gave me. I wasn't getting acquainted and least of all, with any railroad people, so when the legislature of the State of Missouri passed a law creating the Public Utilities Commission, I concluded that here was a chance to get into work that would give me an acquaintance with railroad men. After making a study of public utility problems in the limited time available, I applied for a position in the engineering organization and was appointed assistant chief engineer. Through an acquaintance formed in this position I became valuation engineer of the Burlington, my first railroad position in this country."

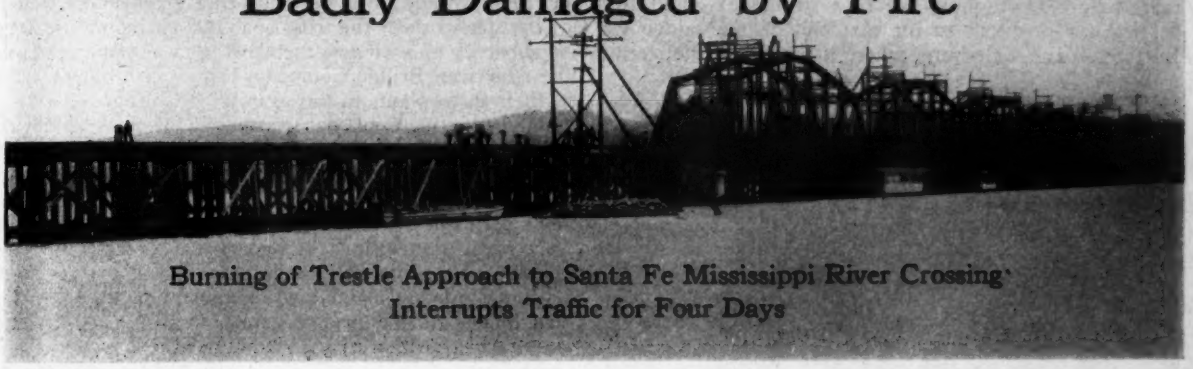
"Do you feel that the increased advantages which you have enjoyed under private operation of the railroads are worth all the hardships you experienced in order to make the change?"

"I certainly do for in no other country in the world could I, an unknown stranger, have gained the position I now hold or have satisfied the craving for self-development and opportunity to work with the knowledge that reward would be measured by one thing only, the worth of one's efforts. I will never regret it unless we suffer the national calamity of government ownership of railroads."

"Do you think," I asked, "that government ownership in this country would lead to the same conditions as those which prevailed in South Africa when you were there?"

"When I compare the workings of practical politics here with the conditions that prevailed in South Africa, I feel that the result would be far worse. To avoid overloading the permanent organization with employees who could not be dropped readily in case economy made it necessary to reduce forces, it was the policy in South Africa to retain a considerable portion of the working force in the status of temporary employees. I was such a temporary employee for ten years, during which the government changed repeatedly, yet I was never in any danger of losing my position. At no time did these changes result in the wholesale ousting of temporary employees such as occurs in this country with the change of Federal, state and city administrations. When I criticize government ownership in South Africa, I criticize the system, not the personnel. I have a high regard for the management of the railways as it was conducted *under the system.* There are many men of high caliber in the service of whom some are my warm, personal friends, but they are not as effective in their work as the great majority of the railway officers in this country for the reason that they have never had the opportunity to do their best and do their work as it should be done. Their greatest handicap is that they work under a system of rules and are powerless to build up their organization on the merit system."

Well Organized Work Restores Bridge Badly Damaged by Fire



Burning of Trestle Approach to Santa Fe Mississippi River Crossing Interrupts Traffic for Four Days

Looking Towards the Iowa Shore

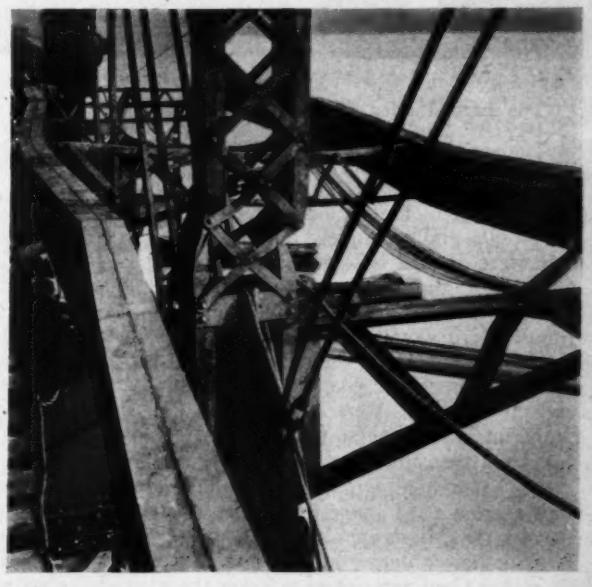
EARLY on the morning of May 24, a fire destroyed 400 ft. of the east approach to the Mississippi river bridge of the Atchison, Topeka & Santa Fe, at Fort Madison, Iowa. It also burned the wooden deck of the easterly river span of this bridge, causing injury to floor and truss members that made this section of the structure unsafe for use until it had been placed on falsework. Through prompt action of the railway management in the dispatching of materials and the organization of bridge and building forces, the bridge was restored to traffic on Monday, May 28, 4½ days after the fire.

The Santa Fe's crossing of the Mississippi river at Fort Madison is a single track structure, 2,960 ft. long, consisting of through steel truss spans and 1,034 lin. ft. of creosoted ballast deck trestle, serving as the east approach. Cantilever roadways on either side of the truss spans serve highway traffic which is continued in driveways flanking the trestle approach, but descending on a grade of 4 per cent so as to permit one of the driveways to pass under the railway trestle, thus bringing the two roadways together on one side of the track.

About 1 a. m. on May 24, a fire was discovered at the point where the wagon roadway crosses under the railway trestle. The cause of the fire is not definitely known but is presumed to have resulted from the ignition of the dust and debris on the roadway from a lighted cigar or match dropped from a passing vehicle. A strong wind was blowing from the northeast, causing the fire to spread rapidly so that when it was finally put out by the fire departments of Fort Madison, and Dallas City, Ill., 400 ft. of the trestle had been burned to the water surface and all woodwork on the highway and railway decks of the easterly span of the river crossing had been destroyed. The effect of the heat on the steel work is indicated in the photographs. Two vertical posts on the down-stream truss were badly crippled, while many of the jack stringers carrying the wagon driveway were so badly warped as to require their removal.

As this bridge is a part of the Santa Fe's Chicago-Kansas City main line, it was necessary to detour the heavy traffic comprising some seven or eight heavy freight trains and an equal number of passenger trains in each direction over the tracks of the Chicago, Burlington & Quincy, from Galesburg, Ill., to Fort Madison, via Burlington, Iowa, and since the Burlington's line from Fort Madison to Burlington is single track and the track layout at Burlington is such as to require the turning of all locomotives, the effect of the detour was to introduce serious delays to the Santa Fe trains while seriously taxing the capacity of the Burlington's facilities. However, in spite of the fact that the detour line is 30 miles longer than the direct route over the Santa Fe, the detouring was handled extremely well. But the situation was one which called for the restoration of the river bridge in the shortest time possible.

System and division officers of the Santa Fe were at the scene of the fire Thursday morning to ascertain the extent of the damage and prepare plans for restoring the structure. Falsework to support the easterly 234-ft. truss span of the bridge, required the driving of 70-ft.



The Heat of the Fire Warped Many of the Jack Stringers and Buckled Two Posts

piles which were dispatched from Somerville, Tex., in a special train of six or eight cars leaving there Thursday night and arriving at the bridge on Saturday night. Stringers, posts and caps for the rebuilding of the trestle approach were obtained from the Edward Hines Lumber Company, of Chicago, being shipped on Thursday evening and arriving at the bridge on Friday morning. Hardware for the trestle and falsework construction were procured at various locations and delivered with equal promptness. Fourteen bridge and building gangs, including four from the Illinois division, three from the Eastern

Kansas division, and seven from the Missouri division, were dispatched to Fort Madison with their outfits so as to be ready to go to work immediately after breakfast on Friday morning. It happened that a steel bridge erecting gang of 30 men had a bridge erecting derrick car at Fort Madison at the time of the fire, and this derrick car was sent to the east end of the bridge via Burlington and Galesburg, where it proved very effective

The Burned Piles Were Cut Off at the Water Line

in erecting the frame trestle bents placed on the stubs of the burned-off piles.

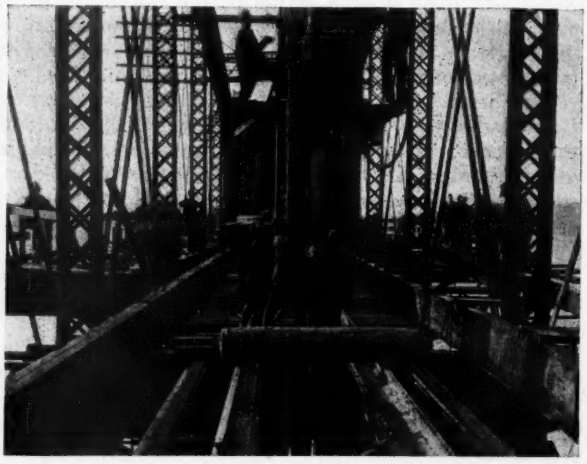
The work of the various carpenter gangs was carried on rapidly and effectively and without confusion. The men were divided into two shifts working 12 hours each except for the time consumed for the lunch period. Every effort was made to save the energies of the men for effective work. For instance, the men were transported to and from their camps on each side of the bridge in passenger coaches handled by switch engines, and these coaches were also brought to the ends of the bridge at lunch time so that the men could be hauled to and from the camps for lunch.

One of the photographs shows the character of frame construction used in restoring the trestle. The bridge crosses the Mississippi river in slack water above the Keokuk power dam and arrangements were made with the power plant authorities to lower the level of the water about 18 in., thus greatly facilitating the cutting off of the piles below the burned tops.

The most difficult portion of the work and the completion of which determined the time when traffic could be restored was the driving of piles for falsework under the truss span. This required 17 six-pile bents with piles 70 ft. long, driven by a driver on the track deck. Until the approach trestle was restored only one driver could be employed, working from the west side, but as soon as the trestle was ready a second driver proceeded out on it and started driving at the east end of the truss span. The handling of the drivers inside of the trusses required some delicate manipulation in order to avoid interference with the top lateral system of the span. To facilitate matters the rod diagonals were removed but the struts were left in position.

The completion of the trestle and the falsework permitted the restoration of traffic on Monday evening, but in the meantime progress was being made in the repair of the steelwork of the truss span, which required a total of about 25 tons of new metal which was obtained from the American Bridge Company, being taken out of stock at their three plants in the vicinity of Chicago. Fabrication of this material was started on Monday, May 28, and all the work was ready for shipment on the following Saturday, June 2. All of it was incorporated into the structure within a week, or by June 9, thus permitting the span to be swung clear of the falsework. However, as a precaution against any excessive deflection of the span because of possible undiscovered injury to the steel, blocking is being maintained on the falsework to within two inches of the bridge stringers until such time as thorough inspection of the structure insures entirely safe conditions.

The most difficult feature of the restoration of the span was the repair of the two posts which had become seriously buckled on account of the fire. Three-foot sections were cut out of these posts with a cutting torch, the burned ends being carefully squared with chisels after which new sections were inserted and thoroughly spliced to the remaining portions of the posts. The insertion of the new sections was accomplished by jacking the top and bottom chords apart at the panel point to secure the necessary clearance.



Driving Falsework Piles for the Injured Truss Span

We are indebted for the above information to A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe System, Chicago.

Welding Society Organizes Training Course—The American Welding Society has issued an outline of a course for the training of oxy-acetylene welders. This report was prepared by a committee and combines the experience of experts of the Federal Board of Vocational Education, the American Welding Society and the National Research Council. For the information of the person who is selecting candidates, the text includes a discussion of the qualifications which the candidates for training should possess. It also includes the fundamentals in gas welding, together with a detailed statement of content, classified under type welding jobs arranged in the order of difficulty.

New Features Incorporated in Water Softening Plants

Illinois Central Has Adopted Conical Bottom Tanks and Filters in Stations Recently Completed

By C. R. Knowles
Superintendent Water Service, Illinois Central

Standard 30,000 Gal. per Hour Treating Plant at Ft. Dodge, Ia. (Left), and Standard 10,000 Gal. per Hour Treating Plant at Rockwell City, Ia., Showing Standard Conical Bottom Steel Tanks and Treating Plant Houses (Right)

THE ILLINOIS Central has recently completed nine new water treating plants and has converted three old intermittent plants into plants of the continuous type and increased their capacity about 75 per cent. In addition this road now has eight new plants under construction. When these plants are completed all water used from Clinton, Ill., through Freeport, to Omaha, Neb., a distance of 600 miles, will be treated, and a total of 40 water softening plants will be in service on the system.

The new plants are all of the continuous type and represent a new design of water treating plant in the construction of the tanks and housing. The tanks are of the conical bottom type with riser pipe and are built in three sizes for plants having hourly capacities of 10,000, 20,000 and 30,000 gal., respectively. They are built in two heights, 35 ft. and 50 ft., the 35-ft. tanks being employed for rehandling plants and the 50 ft. tanks for gravity plants. Five hours' reaction time is provided in all cases, the capacity of the tanks being 50,000, 100,000 and 150,000 gal. Each tank is built with a conical bottom and standard 6 ft. riser pipe, the height of the riser pipe varying from 12 ft. on the 50,000 gal. tank to 8 ft. on the 150,000 gal. tank.

The treating plant houses are of a uniform design and are built in two sizes, 20 ft. by 40 ft. and 20 ft. by 60 ft., depending upon the capacity of the plant and the amount of storage space required. A space of 20 ft. by 20 ft. is reserved for the chemical equipment, filters, etc., and the remainder is used for storage of chemicals, the smaller house having storage space for two cars of chemicals and the larger house for four cars. That portion of the house reserved for the equipment has a 12-ft. ceiling to allow the necessary headroom for tanks, shafting, etc., while the storage room has a 10-ft. ceiling, as it is impractical to pile the chemicals in storage higher than 8 ft.

This type of structure increases the cost of the building slightly but adds materially to its appearance and convenience and is a pleasing departure from the barn-like appearance of many of the treating plant houses formerly constructed.

Conical Bottom Tank a New Development for Water Treatment

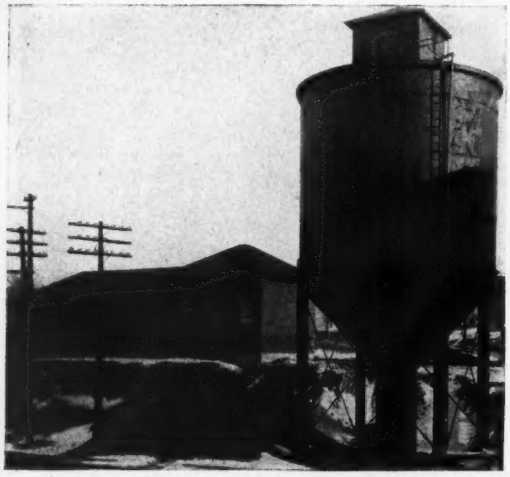
The outstanding feature of these new plants is the conical bottom tank which is a radical departure from the commonly accepted practice of building flat bottom steel tanks of the standpipe type resting upon a concrete ring filled with broken stone or elevated wood tanks of similar design. A great deal of attention was given to the tank in designing these softening plants, and the conclusions reached, which have been borne out in practice, may be of interest.

While the conical bottom steel tank has been used extensively for the past 15 or 20 years as a roadside storage tank and in one or two isolated cases as a combined storage and settling tank, the Illinois Central treating plants are believed to be the first examples of its application purely as a water treating tank. It is true that water treating plants have been built with a cone within the settling tank, and some designs still embody the cone, either in an upright or in an inverted position, but it seems that the conical bottom principle as applied to the outer shell or bottom of the tank with a riser or mud drum has not been given serious consideration by designers of water treating plants.

It is generally conceded that this type of tank presents a more pleasing appearance than the flat bottom standpipe type of tank commonly used as a treating tank, and it is claimed to be more efficient and economical in many other respects. While some of the points claimed for it may be open to question, the Illinois Central tanks are proving a very satisfactory and practical design of tank for water softening.

The cost of the conical bottom tank is greater than the standpipe type for a given capacity. The entire capacity of the tank can be used, however, while there is some question as to whether all of the standpipe tank is actually utilized in water softening. Some authorities on

water softening maintain that the movement of the water after leaving the downcomer is at an angle of 40 to 60 deg. upward and outward toward the walls of the tank and that the water in the angle formed by the bottom and walls of the tank may be classified as dead water and should not be considered in figuring the available reaction time. This is undoubtedly true to a great extent, depending, of course, upon the relative temperatures of the incoming water and of the water in the tank. If the temperature of the incoming water is higher than that of the water in the tank, the movement as it leaves the downcomer will naturally be upward and as the temperature is equalized by contact with the water in the tank, it will probably spread toward the outside of the tank at an angle



Standard 20,000 Gal. Per Hour Treating Plant at Wall Lake, Ia., Showing Standard Conical Bottom Steel Tank and Treating House

from the downcomer. On the other hand if the temperature of the incoming water is lower than that of the water within the tank, the movement will be along the bottom of the tank and the dead water will be displaced until the temperature of the water is equalized.

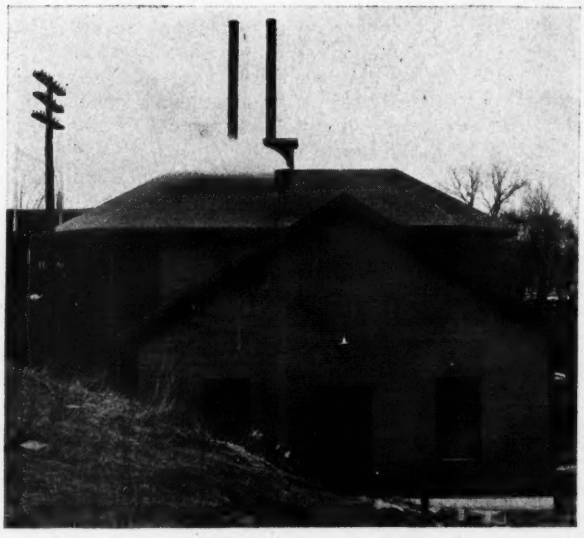
This is of first importance in the selection of the type of tank to be used in the treatment of well waters. The temperature of well waters as a general rule remains practically uniform at all times, being lower than the atmospheric temperature during the summer months and higher during the winter months. Therefore, it is natural that the reaction time in treating well water in a flat bottom tank will vary with the seasons, reaching the maximum during the hot summer months when the temperature of the water in the tank is higher than that of the ground water. If the rated capacity of the treating plant is based upon the total capacity of the tank, it is obvious that the plant cannot be operated at the same rate and obtain the maximum efficiency and reaction time during the winter months when the opposite is true as to the relative temperature of the water.

The upward movement of the water in a conical bottom treating tank of the proper design must follow the bottom of the tank closely regardless of temperature and all space within the tank is constantly available for treatment and reaction; therefore in making a comparison of the cost of flat bottom and conical bottom tanks for treating water an allowance should be made for a larger tank of the flat bottom type to allow for variations in temperature. These features together with the additional cost of an efficient sludge system were given consideration in designing the Illinois Central plants and the difference in first cost was found to be in favor of the conical bottom tank.

The principal advantage of the conical bottom tank in water softening is found to be in the collection and removal of the sludge and the resultant saving in water used for sludging over the flat bottom tank. This feature alone will pay a good return on the cost of the tank. In the flat bottom tank the sludge is distributed over the entire bottom of the tank and its removal necessitates the construction of an expensive sludge collecting system, usually consisting of pipe with openings placed at intervals over the bottom of the tank, the most efficient of which are so arranged that the system may be operated in sections with from two to four sludge valves for each tank. Another type of sludge system is so constructed that the collecting pipes may be rotated over the bottom of the tank. None of these systems have been found entirely satisfactory, however, as they will not completely remove the sludge and are wasteful of water, as the sludge nearest the outlet is the first to be picked up and from two-thirds to three-fourths of the openings are discharging clear water long before the sludge near the outer edge of the tank is disturbed.

The sludge falls to the bottom of the conical bottom tank and accumulates in the mud drum or riser where it is easily removed through a single opening and with a minimum waste of water. Actual tests to determine the amount of water in removing sludge show that the flat bottom tank requires from four to eight times more water than a conical bottom tank, depending on the efficiency of the sludge system and the amount of sludge deposited.

A test was made to determine the amount of water required to remove the sludge from a flat bottom tank 22 ft. in diameter after 12 hours' operation, during which time

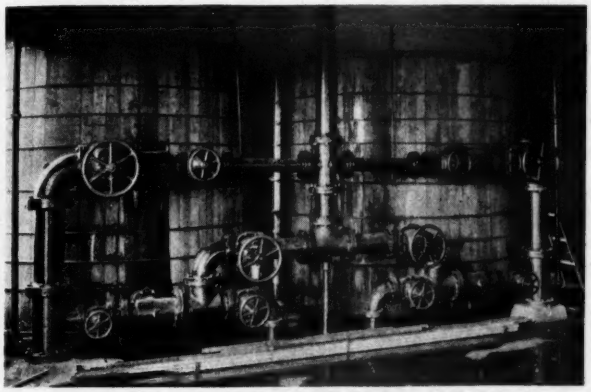


Intermittent Plant Converted Into Continuous Plant with Gravity Filters at Manchester, Ia., with a Capacity of 20,000 Gal. Per Hour

120,000 gal. of water had been treated, the sludge amounting to approximately 520 lbs. About 5,000 gal. of water was wasted and while a great deal of the sludge was removed, the tank was not clean by any means and repeated opening and closing of the sludge valve brought quantities of sludge, the stream of water being clear with streaks of sludge through it. The tank was drained of all water and it was found that the openings in the sludge system collected the sludge for only a short distance around the openings and the sludge had accumulated to a depth of three feet all around the edge of the tank. There was also a great deal of sludge between the sludge lines. Examination of the tank proved conclusively that the removal

of sludge in a flat bottom treating tank is very expensive in the use of water and in most cases is inefficient and incomplete so far as the complete removal of the sludge is concerned.

A similar test was made with a conical bottom treating tank 28 ft. in diameter. After 60 hours' operation, during which time 1,000,000 gal. of water had been treated, and the sludge deposit amounted to over 4,000 lb., it was found that 2,300 gal. of water was sufficient to remove the sludge completely. The practice on the Illinois Central is to wash the sludge out twice a day and the water required for this purpose rarely exceeds 1,200 or 1,500 gal. daily, while to do the same work in a flat bottom tank would require 8,000 or 10,000 gal., a conservative esti-



Gravity Filters Installed in Manchester, Ia., Water Softening Plant

mate of the amount of water saved daily being 7,500 gal. which, at the low rate of 15 cents per thousand gallons for pumping and treating, means an annual saving of over $400 per year or six per cent on an investment of over $6,500.

The conical bottom tank also has a decided advantage over the flat bottom tank for water softening in the rate of upflow. For example: a 30,000 gal. per hour treating plant will require a tank of 150,000 gal. capacity (based upon Illinois Central practice which provides five hours reaction and settling time). Assuming a height of 50 ft. for the softening tank a flat bottom tank of the desired capacity will have a diameter of 22 ft. 6 in. and a rate of upflow of 8 ft. 4 in. per hour. A conical bottom tank will have a diameter of 28 ft. 8 in. or a rate of upflow of 5 ft. 4 in. per hour. If the reaction time is only four hours, which is common practice, the rate of upflow in a flat bottom tank is over 12 ft. per hour while the rate in a conical bottom is less than 8 ft.

Other advantages found in the conical bottom tank are greater convenience for location of piping, valves, etc. The inaccessible portion of the bottom is reduced to a minimum which permits better maintenance as there is only a small portion of the bottom that cannot be painted. This design also permits better foundation design and distribution of load.

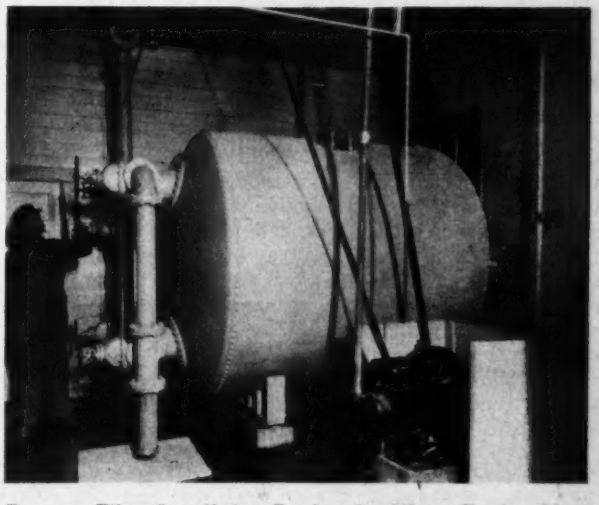
Filters Are Provided

All of the new plants as well as the remodeled plants are equipped with filters to remove the suspended matter that will not settle from the water. These filters are of three types, excelsior or wood fibre filters being installed in three of the gravity plants while five are equipped with pressure sand filters and the four rehandling plants have open gravity sand filters. Sufficient head is provided above this roadside tank to overcome the resistance of the filter beds and water flows by gravity from the softener to the storage tank while the rehandling plants have clear wells or basins into which the water flows from the open sand filters and is repumped to the storage tanks.

The filters have proved valuable additions to the Illinois Central plants, especially in the handling of river supplies, carrying much suspended matter as well as in preventing after precipitation and have been instrumental in reducing foaming of treated water. They are a decided improvement over the use of sulphate of iron which is employed only when some of the older plants have been operated in excess of their capacity. The rate of filtration is slightly over two gallons per square foot of filter area in the sand filters and about one gallon per square foot in the excelsior filters.

Most of the plants are equipped with separate batch and control or chemical feeding tanks so that a batch of chemicals of the required strength may be mixed without interruption to the operation of the softener. This feature also assists in more readily and accurately changing the strength of the solution fed when the character of the untreated water changes. Particular attention has been given to thorough mixing of the chemical solution before it is introduced into the untreated water, both batch and feeding tanks being equipped with mechanical agitation, the chemicals being thoroughly mixed first in the batch tank and kept in a uniform solution by the agitators in the feeding tank.

The treating tanks in all of the new plants are of sufficient capacity to permit five hours reaction time when the plants are operating at maximum capacity. This feature together with the low velocity of water through the plant and with filtration produces a water that is not only soft but clear and troubles from after precipitation and foaming are reduced to a minimum. This reaction time will also permit of operating the plants at an overload of 25 per cent if necessary in the event of an exceptionally heavy demand for water, without greatly burdening the filters.



Pressure Filter Installed at Dunlap, Ia., Water Testing Plant

All of the plants are heated with either hot water or steam heat. Where the plants are located at steam pumping stations or power plants they are heated by steam. At other points hot water plants of the Arcola type are installed. Sufficient radiation is installed to maintain a temperature within the house of 70 degrees with an outside temperature of 20 degrees below zero. Radiation is also installed in the headhouse and in the

valve pit beneath the tank. The heaters are designed to burn either hard or soft coal and not only furnish more efficient and uniform heat with a lower fire risk than stoves but are more economical in fuel.

Seven of the new plants recently completed are located between Omaha and Fort Dodge, a distance of 140 miles. They cover an entire engine district and provide treated water for all locomotives operating in this territory. Three of the plants now under construction are located between Fort Dodge and Waterloo, a distance of 100 miles, comprising another engine district, and five between Freeport and Clinton, two complete engine districts. This is in line with the general policy of the Illinois Central of equipping engine districts complete, thus assuring a uniform quality of water to all locomotives. It results in much better operation through the prevention of excessive foaming and other troubles due to the mixed use of treated and untreated water in the same boilers.

All plants are ground-operated, all of the operating equipment requiring attention being located in the equipment room at ground level. The chemical charges of a given strength are prepared in batches and sufficient of this solution is admitted to the control or feeding tank for 10 to 12 hours' treatment. Aside from the mixing of the chemical charges and the tests of the treated water, which are made daily by the plant attendant, the plants require little attention. Where a regular pumper is employed the treatment of water is made a part of his duties and at other points where no pumper is employed, an attendant is employed or the duties of operating the plant are combined with other work.

A feature worthy of special note in the construction of these plants is the standardization of tanks and housing. All tanks are of the same design and of the same size for a given capacity and type of plant. The height of tanks is also uniform, a height of 50 ft. being maintained for gravity plants and 35 ft. for rehandling plants. This avoids different diameters for tanks of the same capacity. By this adaptation of heights and sizes it is possible to construct treating plants of any capacity or type with tanks of only three diameters and two heights and conforming to manufacturer's standards. This is an important feature in keeping the cost of the tanks down and also insures more prompt deliveries. The design of the housing is uniform and is confined to two sizes. No attempt has been made to standardize on the type of treating equipment, the design of plant being such that any water softening equipment on the market can be adapted to use in the plant at no additional expense.

While the new plants have not been in service long enough to enable any definite figures or saving to be compiled, there has been a material improvement in boiler operation and the plants will show a good return on the investment in fuel saved, boiler repairs, improved train operation, etc., as the waters treated are among the worst on the system, ranging from 30 to 60 grains hard.

Major Considerations Governing a Rail Relaying Program

By B. M. Cheney

General Inspector of Permanent Way and Structures, Chicago, Burlington & Quincy, Chicago

THERE ARE so many angles to the question of rail relaying that a comparison of the amount of rail used in renewals on different roads or on different divisions of the same road is of little use, except after a very thorough analysis of standards of maintenance, volume and class of traffic, motive power used, curvature, grades, sub-soil, ballast, ties, rail joints and even joint fastenings. Such an analysis may often reveal that after equating all conditions that affect the life of rail, the road or division using the greater tonnage in renewals per mile of line or per million gross tons is pursuing the more economical policy.

The following comparisons of the quantity of new rail used in renewals and charged to operating accounts by six large eastern roads are based on returns to the accounting circulars of the Railroad Administration. They cover the fourteen-year period from 1908 to 1921 inclusive, and represent 60,000 miles of track maintained.

	Road					
	A	B	C	D	E	F
Tons of new rail laid annually per mile of all tracks maintained	4.85	4.50	4.06	2.53	3.21	4.06
Tons of new rail laid annually per million gross (equated) ton miles...	1.37	1.15	1.16	0.76	0.98	0.78
Average annual M W & S expense for 10-year period ending June 30, 1917.						
Acct. 212—Ties	$166	$191	$165	$120	$136	$219
Acct. 214—Rail	57	51	38	33	35	40
Acct. 216—Other track material	51	57	45	37	52	60
Acct. 202-220—Roadway and track	457	516	536	416	595	549
Struct. and miscellaneous	342	319	280	280	295	355
Total M W & S (incl. shop machinery) ...	$1,073	$1,134	$1,064	$886	$1,113	$1,223
M W & S per million gross ton miles.....	216	219	231	183	230	177

A study of the figures below will raise many questions. Is there any significance in the fact that on Road "A," where the cost of rail is high, the cost of ties is not quite three times that of rail, while on the other roads the cost of ties is four times that of rail? Has the heavier rail with its wider base conserved ties? It will also be noted that on all roads except "A" the cost of other track material runs higher than rail. Does this indicate more rapid wear of fastenings used on lighter sections, the necessary use of more tie plates, the use of untreated instead of heat-treated bolts and bars, or perhaps less efficiency in the reclamation of second-hand fastenings?

Roads "C," "E" and "F" have very low expense on account of ties and rail, while the expense charged to "Roadway and Track" is abnormally high. Is the money saved on rail and ties being spent two or three times over in increased maintenance of track?

Why is Road "D" low on all items? Is it due to less density of traffic or is it possible that during a few years just prior to 1907 unusual expenditures were made, or that during the latter part of the period, maintenance expenditures were deferred?

It is not the intention to try to analyze the figures. They are shown to emphasize the fact that offhand comparisons may be worthless. A study of the figures will, however, raise various questions that are pertinent in the development of an economical policy governing rail renewals.

It is the common practice to lay new rail on the more important lines, using relayer rail for branch lines and side tracks, the extent of new rail territory being gov-

erned more or less by the branch line and side track requirements, for on all large systems there are some lines on which either new or relayer rail may be used economically.

The policy governing rail relay must be worked out on each individual road and the more one studies this problem the more evident it becomes that no one general formula or set of rules can be prepared that will apply equally well on all roads. Assuming, however, a policy under which new rail is to be laid only when necessary, what are the reasons that justify such relay and what measures may be applied to keep the old rail in track a few years longer?

1. "Battered ends" cause poor riding track and make maintenance costs higher. On an important passenger line the hammer on battered ends is annoying. The roadmaster says the rail must be relaid, but before placing it on the program there are several questions to be considered, viz.:

(a) If the batter does not extend back from the rail end more than six inches it may be economical to build up the ends by the oxy-acetylene process.

(b) Perhaps the joints are worn out, in which case it may be economical to replace them with new. Slight batter will often iron out after new joints are applied, and if batter is more serious, but short, the rail ends may be welded. The expense of building up rail ends increases rapidly with the length of batter and it may often be found more economical to relay the rail. On tracks where traffic is all in one direction it will often be found that a change of joints will effect little or no improvement, as the wear of the fishing surfaces of the receiving rail will prevent a good fit of any joint.

2. "Surface bent or line bent rail" on high speed passenger lines must be replaced. On other lines when the safety of trains is not involved the extent of surface or line bend in rail that can be tolerated must be measured by its effect on equipment and track maintenance. Released surface or line bent rail should always be straightened before being again applied in any track, as the cost of straightening is slight compared to the increased expense of maintaining such rail in track.

3. "Curve wear" may be so extensive on both rails that they must be relaid. Usually it is found that the high rail is still suitable for use as low rail and may be thrown over and used without disconnecting. The fact that rail on a curve has worn out does not justify the relaying of the connecting tangents, although a certain amount of fairly good tangent rail must be released each year for use as repair rail. It may often be preferable to obtain repair rail by relaying a stretch of fairly good tangent rail, choosing some stretch of track that requires surfacing.

Curves where rail wears out much more rapidly than that in the connecting tangents should receive special consideration. It is possible that some special steel would so equalize the length of service that curves and tangents would wear out together.

4. "Worn-out rail" in straight track may be evidenced by the head being worn down or by an excessive number of failures. Such rail must be relaid and is only suitable for light branch lines or side tracks.

5. "Defective rail," such as certain heats in which a number of transverse fissure failures have occurred, must be replaced as a safety measure. An epidemic of transverse fissure failures in rail rolled at a certain mill early in 1913 made it necessary to remove all of that rail from main track several years before its relaying would otherwise have been necessary. Rail rolled in another mill in 1912 proved soft and had to be relaid several years before older rail in the same territory.

6. Relaying rail with heavier pattern is often found necessary due to changed traffic conditions. This often accounts for the lack of uniformity in rail renewal programs and makes comparisons difficult unless a period of twenty years or more is considered.

To get the most out of rail it must be laid properly. The foreman who makes a record for feet laid per day per man is often lauded, whereas a careful inspection of his track might show that he should have been censured. The extra gang foreman is chiefly interested in daily performance, but when he has passed on, the section foreman may be obliged to put in many man hours straightening "cocked" joints, adjusting expansion or seating tie plates. And, if these faults are not corrected immediately after the rail is laid, poor track and shorter life of rail may be the result.

The one thing that will do most with the least investment to lengthen the life of rail is the continual maintenance of tight joints. To this end the best joint and joint fastenings obtainable should be used. Add to this a regular program of wrenching and replacement of worn-out joints and fastenings and the maximum life of rail should be obtained.

An Interesting Bridge Failure

ON MAY 18 a bridge collapsed under a freight train on the Norfolk Southern near Hertford, N. C., resulting in the death of two employes and the injury of two more. Starting from the north end, this structure consisted of a pile trestle 147 ft. in length, a draw span 77 ft. in length and another pile trestle 194 ft. in length. The train involved in the accident was southbound and consisted of 47 cars and a caboose. After taking water at a tank about 100 ft. from the north end of the bridge, it proceeded onto the structure and was moving at a speed of about four miles per hour when the bridge gave way and all but the first four bents of the 13 comprising this portion of the trestle collapsed.

The bridge was constructed originally in 1881 with four piles supporting each bent and three additional piles were added to each bent in 1890. The tops of the piles were cut off 18 in. below the surface of the water, base sills 12 in. by 12 in. by 24 ft. were drifted to each pile and framed bents were erected on these sills, supporting two 8-in. by 16-in. stringers 25 ft. long under each rail, the ties being fastened to these stringers. The bents were cross braced and the entire structure was braced longitudinally. The superstructure was rebuilt in 1900 and again in 1920, although the piling at the point of the accident was that driven originally in 1881 and 1890.

The section foreman had examined this bridge above the water line two days prior to the accident and the roadmaster about two weeks previously without noting anything wrong. The bridge tender had passed over the structure about 2½ hours prior to the accident and noticed nothing wrong and another freight train had passed over it about 20 minutes prior to the accident. The roadmaster also found no evidence of decay in the timbers that came to the surface after the accident.

In its investigation to determine the cause of this accident, the Bureau of Safety of the Interstate Commerce Commission concluded that the inspection of the bridge itself failed to bring out the reason for its collapse, but suggested the possibility that one of the bents had slid from the top of the piling into the water, allowing the stringers to sag under the weight of the engine and leading to the collapse of the structure.

Securing Economy in the Heating of Stations and Buildings*

A Discussion of the Fundamental Principles Involved in Various Types of Systems

By R. W. Noland

Professor of Heating and Ventilating, Purdue University, Lafayette, Ind.

In order to collect data on existing heating conditions in railway buildings, a questionnaire was sent to about one hundred representative railways of the country. In this questionnaire the buildings were grouped under six heads, with a special column for miscellaneous types. Under types of heating plants are eight common methods of heating; namely, stoves, hot air furnaces, hot water plants, gravity steam plants, vapor and vacuum plants, blower systems for heating only, blower systems for both heating and ventilation, and unit ventilators or unit heaters with an extra column for systems not listed.

DATA ON EXISTING HEATING CONDITIONS IN RAILWAY BUILDINGS

Type of Building	Number of Buildings	TYPE OF HEATING PLANT: Stoves	Hot Air Furnaces	Hot Water Plants	Grav. St. Plants	Vapor Steam Vacuum	Blower System: Heat Only	Blower System: Heat and Vent.	Blower System: Unit Vent. or Heaters	Other Systems
Office Buildings	501	237	1	10	163	51	19	1	8	0
Shop Buildings	803	243	0	0	263	123	44	17	7	7
Round Houses	525	209	1	0	136	106	18	29	13	1
Store Houses	494	148	0	0	190	66	15	5	0	1
Large Stations and Terminals	320	18	15	21	207	63	4	2	0	0
Medium and Small Station Buildings	9,648	6,238	64	565	180	31	71	1	0	0
Extra Buildings	134	36	1	17	36	18	1	1	0	0
Total	12,125	7,143	82	613	1,175	458	172	56	28	9
*Approximate Tons of Coal Per Year	46,312	18,721	1,204	47,865	19,585	8,700	1,225	Exh. Steam	Exh. Steam	Total 216,525

*Incomplete on account of lack of data.

The results given in the table are the sums of all the results taken from all of the questionnaires received, and it is thought that they are fairly representative of general conditions of heating in railway buildings. Under approximate tons of coal burned per year, the results do not show the total tons burned for the systems listed, as in many cases there seems to be no data available along this line, so only totals as received are listed. However, comparison of the tonnage as given will convey some idea where the fuel goes, from a percentage standpoint, at least.

An examination of the distribution of different methods of heating among the various types of buildings, brings out some interesting facts. One of the most striking of these is shown graphically, giving a comparison of the number of railway buildings of different types requiring heat. This figure shows that the medium and small station buildings far outnumber all the other buildings put together. While this is probably not surprising, it does show that probably the heating of these buildings presents a greater problem as far as economy goes than all the others put together. The distribution of the various types of heating systems among the different types of railway buildings is also shown graphically. The first conclusion reached after looking at this table is that entirely too many stoves are in service in railway buildings. There is no doubt but that the fairly small number of blower systems shown is due to the fact that these systems are used only in large buildings. Since the problem presented in the economical heating of railway buildings is not materially different from similar problems encountered in the heating of any building of corresponding size and use, a description of the various types of heating sysems and the application of these systems is of value.

Gravity Hot Air Furnaces

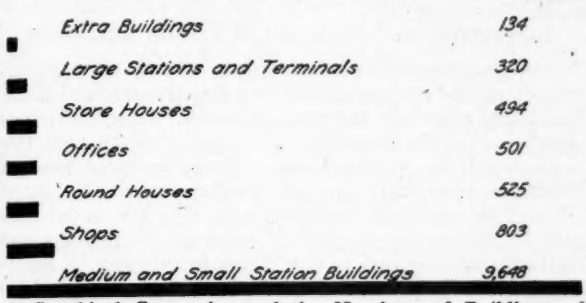
In general, if we omit stoves and fireplaces, gravity hot air heating is the simplest system in common use and is the least expensive to install. It furnishes fresh air and ventilation if so desired, heats up quickly, is easily regulated as to the quantity of heat supplied, and does not freeze up. The chief disadvantages of this system are: The unevenness of the heat supply to the different parts of the building, the difficulty experienced in forcing the warm air into remote parts of the buildings in case of high winds, the system acts more or less as a dust collector, and the air is oftentimes overheated when it enters the room. The pipeless furnace does very well where only one room is to be heated and would undoubtedly work to some advantage in small station buildings which are provided with a basement and which consist practically of one room. There is considerable heat loss to the basement through the pipes of any hot air furnace heating system. If properly installed, a hot air furnace heating system is fairly economical and gives good service when installed in small or medium sized buildings which are compactly constructed.

Gravity Hot Water Systems

In gravity hot water heating systems, the entire system is filled with water up to some point in the expansion tank, and the air is vented through hand operated air valves placed at the high points of the system. When a fire is built in the boiler, circulation currents are established due to the heating of the water directly above the fire. The water is cooled in the radiators and the heavier cooled water is displaced by the warmer water and finds its way back to the boiler. The greatest advantage of hot water heating is the flexibility of regulation, because during mild weather the water may be circulated at a temperature just sufficient to meet the heating requirements, while in cold weather the temperature may be raised to a point but little below that of low pressure

*Abstracted from a paper presented before the International Railway Fuel Association at Cleveland, Ohio, May 21-24.

steam heating. Also, any room, even though it is fairly remote from the boiler, may be reached and heated as easily as with steam. The principal objections to hot water heating are the dangers of freezing when the radiators are shut off in unoccupied rooms and the length of time necessary to warm up a building in the morning. In one sense, while slowness in heating up may be a disadvantage, it is offset by the fact that when once warmed the temperature of a building heated in this manner does not fluctuate so rapidly as when either hot air or steam

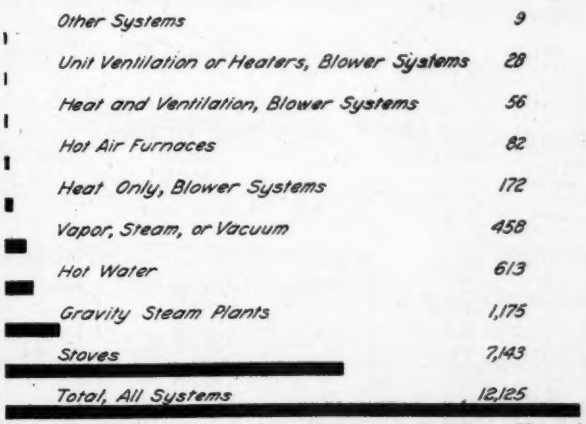


A Graphical Comparison of the Numbers of Buildings of Various Types Requiring Heat

is used. In comparison with steam systems a radiator about 50 per cent larger must be used on hot water systems. It is common to install hot water systems in buildings up to several thousand square feet capacity.

Gravity Steam Heating Systems

Of these, the one-pipe upfeed system is perhaps the most commonly used. It is the cheapest steam system to install, and if properly installed with sufficient pitch on all the piping and radiators in order that the condensation will drain freely back to the boiler, it gives good results. In the steam connections to the radiators, and



A Graphical Comparison of the Number of Buildings Heated By Various Systems

in the risers, the steam and water of condensation must flow in opposite directions in the same pipe. This sometimes causes water hammer and other disturbances. The automatic air valves used on systems of this type sometimes give trouble and cause air binding in the radiation. A pressure of from one to five pounds must be carried in the boiler in order to obtain proper circulation of the steam.

The downfeed system is also fairly common, especially where there is more room to install the main overhead in the attic than there is in the basement. It also has the advantage that the steam and condensation travel in the same direction in the risers. The only place where it is necessary for the steam and water to travel in opposite directions is in the one-pipe down-feed system as shown on the left side of the drawing. The two-pipe downfeed system eliminates this difficulty altogether, but of course, is more costly to install. In any two-pipe steam system, that is, where the radiator is provided with both a supply and a return connection, the return must be so sealed that steam will not short-circuit and blow directly through the radiator into the return system. This is accomplished by means of the water seals or U connections as indicated. A gravity steam system may be installed in almost any size of building. Of course, any steam system has the same advantage as water, in that the steam may be carried to any point desired with small loss. Both steam and hot water systems are likely, if properly installed, to be more economical of fuel for the space heated than the hot air, because it is possible to take the heat to the point desired. When compared with hot water heat, steam has the advantage of smaller radiators, practically no danger of freezing if ordinary precautions are taken, and greater flexibility as regards warming up or cooling off a building quickly.

Vacuum and Vapor Systems

One of the figures shows the more improved types of steam heating systems, commonly known as vacuum and vapor systems. In the two-pipe mechanical vacuum system shown, which is the common type of vacuum heating system, the supply pipe is installed in practically the same manner as in a gravity heating system, but the return end of each radiator is provided with a radiator trap which is so constructed that it allows water and air to pass, but retains the steam in the radiator. The system of return risers connects into a return main which in turn is connected into the suction of a vacuum pump. This pump handles both air and water and maintains any desired vacuum on the return lines. The discharge from this pump is connected into a receiver or standpipe or some other apparatus which separates the air from the water, and the water is returned to the boiler by means of some type of boiler feed pump.

The chief advantages of a vacuum heating system are that air and condensation are removed quickly from the radiator, due to the differential obtained by means of the vacuum in the return lines, and that a lower pressure can be carried on the supply side of the system. The latter is a point of great advantage when exhaust steam is used, because of the fact that it reduces the back pressure on the engines. Lifts may be taken care of in the return line or it may run practically without grade from a remote point back to the vacuum pump. Sometimes this is quite an advantage, especially in heating a factory type of building. In general, there is no limit to the size of building which may be heated by a vacuum system. The first cost of a vacuum system is considerably higher than a gravity steam system of the same size. Ordinarily, it is not economy to install a vacuum system in a small or medium sized building because of the high first cost and unnecessary complication of equipment.

The vapor heating system is a development from a combination of the mechanical vacuum system and the gravity steam system, no mechanical devices being needed in the operation of a vapor system. Ordinarily the radiator is provided with a radiator trap of the same type as is used in the vacuum system. No air valves are instlled on the radiator, the returns carry both water and air back to some point higher than the boiler where the air is vented out through a special vent and the water returns to the boiler by gravity. Usually pressure of only a few ounces is carried in the boiler, although by a special arrangement of return traps, any pressure can be carried

in the boiler and the system will operate satisfactorily. The advantages of the vapor system are: a combination of the advantages of hot air, hot water and gravity steam systems, provided that the vapor system is carefully installed. It will heat up quickly, without air binding, it is easily regulated and is economical to operate and it is the ideal system for medium sized buildings and is now being installed in many very large buildings now being constructed.

Blower Systems

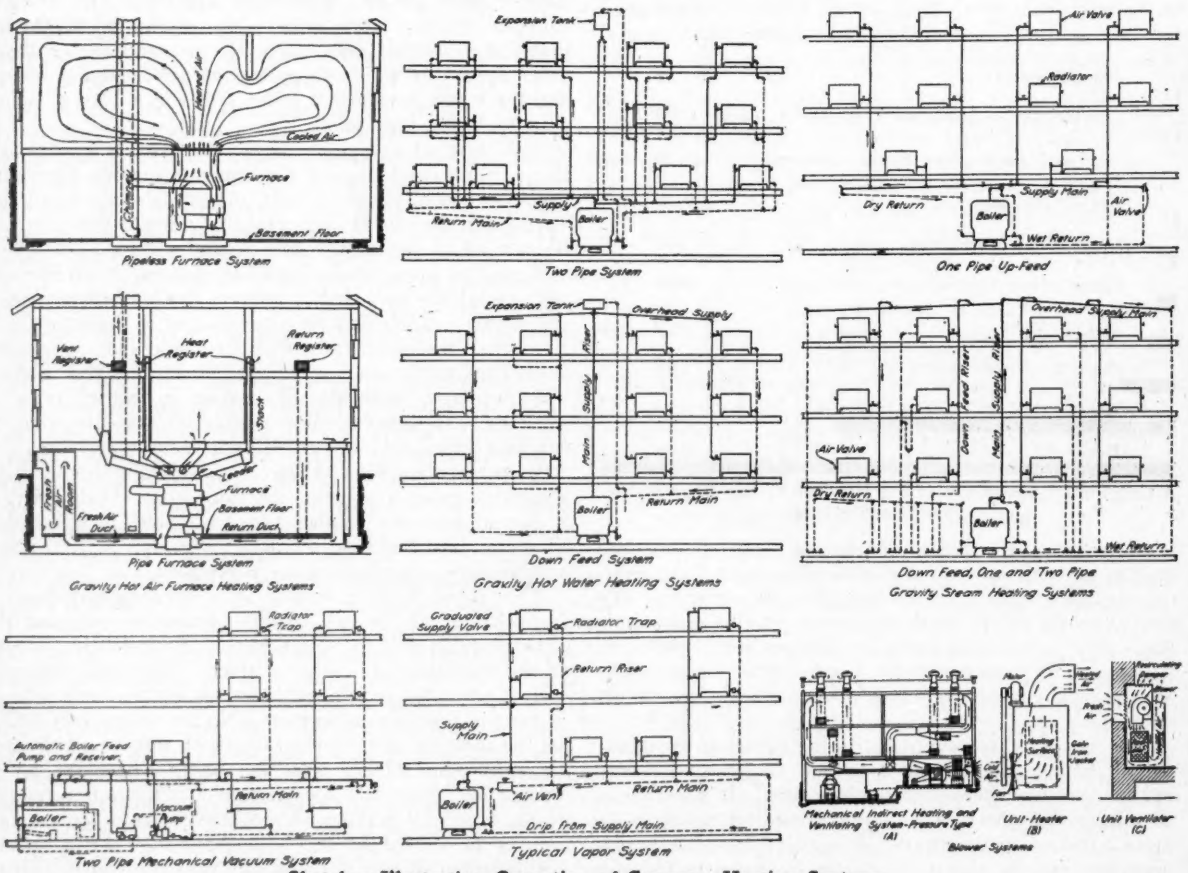
The mechanical indirect heating and ventilating system of the pressure type, shown in A, in one of the figures, is adaptable to almost any type of large building. The air is heated by passing over a system of coils or radiators, and is carried to various parts of the building through a system of ducts, the motive power being a centrifugal fan connected with the inlet end of the duct system. The air may be vented to the outside and all the fresh air may be drawn from the outside, or the ventilators may be closed and the air recirculated, according to conditions desired in the specific installation. It has become common practice to install blower heating systems in shop buildings, and it is probably one of the best methods in use for heating this type of building where both ventilation and heating is desired.

The unit heater, shown in B, is simply a small edition of the system just described and is, as the name implies, a unit blower heating system built up in one piece so that it may be located at any convenient place in a shop or large room and may be moved and piped up elsewhere when necessary. This type of heater is coming into very common use in old buildings which were not provided with proper heating systems at the time the building was erected. It requires no particular skill to install a unit of this nature, and it fills a long-felt want in the heating field.

The unit ventilator, shown in C, is built on the same order as a unit heater, except that it is provided with an outside or fresh air inlet in connection with a recirculating opening. This type of heater is adapted to schools and offices and similar types of buildings, and if properly installed would be very good in the medium sized station building.

Suggestions for Betterment of Present Conditions

The greatest waste of fuel in heating railway buildings occurs in the heating of the smaller or medium sized buildings, especially the small stations. It is likely that nearly all of the stoves now in use in buildings of this type should be discarded and replaced by some type of modern economically-operated heating stoves. Of course, in some of the small one-room buildings, the stoves may still be the proper method of heating. It is suggested that if it is necessary to use stoves in this sort of building, a stove of the baseburner type or of some type which supplies an even degree of heat with attention at long intervals, should be installed. A pipeless furnace would not work badly in any of these buildings. Where the building has more than one room or consists of several rooms, a first-class hot water or vapor system would probably give the best results. If the station is of a size where the waiting rooms are occupied by several people a considerable portion of the time, some type of unit ventilator installed in connection with a vapor system would make an ideal installation, the operation of the ventilator being under the control of a conscientious attendant.



Sketches Illustrating Operation of Common Heating Systems

Baltimore & Ohio Analyzes Results of Cross Tie Treatment*

Detailed Study of Test Installation Demonstrates Economy of Preservation of Inferior Woods

BY EARL STIMSON
Chief Engineer Maintenance, Baltimore & Ohio

A TEST section of 5,230 sawed and hewn cross ties, treated and untreated, was installed between Windsor and Blanchester, Ohio, on the Baltimore & Ohio Railroad during March, 1911, and has, therefore, been in service 12 years. The record of renewals to date, and the condition of ties as shown by recent inspection, give data for some interesting statements of values. The purpose of the test was to determine relative values of various kinds of preservatives used in different kinds of wood as compared with the untreated white oak tie.

A description of the original installation with record of treatment is shown in the following statements:

TIES					PRESSURE TREATMENT								
						Initial Vacuum		Pressure		Temp.		Absorption	
Sect.	Number	Length of Track	Kind of Wood	Size	Kind of Treatment	Inches	Time	Lbs.	Time	Tank	Retort	Per Cu. Ft.	Per Tie
1	1,237	2,268	R. Oak, H. Maple, Beech, Gum, Elm	7"x9"x8½'	Card.....	23	1 hr. 5 m.	175	6 hr. 10 m.	153°	152°	0.5 lb. Zn. Chl.	5.5 gal.
2	760	1,393	W. Oak, B. Walnut, R. Oak.....	7"x9"x8½'	Untreated.							2.0 lb. Creos...	5.5 gal.
3	875	1,604	R. Oak, H. Maple, Elm, etc.....	7"x9"x8½'	Straight Creosote...	24	0 hr. 25 m.	160	2 hr. 40 m.	178°	163°	5.7 lb. Creos...	2.7 gal.
4	1,107	2,030	Beech, H. Maple, Gum, Elm, etc....	7"x9"x8½'	Card.....	23	1 hr. 0 m.	175	4 hr. 50 m.	137°	157°	0.5 lb. Zn. Chl. 2.0 lb. Creos...	5.5 gal.
5	250	460	Gum, H. Maple, Elm, Beech, etc....	7"x9"x8½'	Straight Creosote...	24	0 hr. 25 m.	160	2 hr. 40 m.	178°	163°	5.7 lb. Creos...	2.7 gal.

					OPEN TANK TREATMENT						
					Av. Temp.			Av. Time		Av. Absorption	
					Begin	Max.	End	Max. Temp.	Total	Per Cu. Ft.	Per Tie
6	1,001	1,835	R. Oak, Elm, H. Maple, Gum.....	7"x9"x8½'	Timber Asphalt...	182°	212°	170°	10 hrs.	32 hrs	6.9 lb. Timb..... Asphalt.....	3.3 gal.
Total	5,230	9,590									

ROADBED					TRACK						
					Alignment						
Sect.	Cut or Fill	Height	Soil	Drainage	Tangent	Curve	Curve Degree of	Ballast	Rail	Tie Plates	Spikes
1	Fill.....	5' to 8'	Sandy.....	Good.....	2,268			Gravel....	90 lb. R.B.	Economy 7"x9"	Cut ⅝"x6"
2	Fill.....	5' to 8'	Clay.....	Good.....	1,393			Gravel....	90 lb. R.B.	None	⅝"x6"
3	Fill.....	5' to 8'	Clay.....	Good.....	1,604			Gravel....	90 lb. R.B.	Economy 7"x9"	⅝"x6"
4	Fill.....	5' to 8'	Clay.....	Good.....	2,030			Gravel....	90 lb. R.B.	7"x9"	⅝"x6"
5	Fill.....	5' to 8'	Clay.....	Good.....	460			Gravel....	90 lb. R.B.	7"x9"	⅝"x6"
6	Fill.....	5' to 8'	Clay.....	Good.....	385			Gravel....	90 lb. R.B.	7"x9"	⅝"x6"
6	Fill.....	5' to 8'	Clay.....	Good.....		1,037	0°45'	Gravel....	90 lb. R.B.	7"x9"	⅝"x6"
6	Fill.....	5' to 8'	Clay.....	Good.....		413	0°28'	Gravel....	90 lb. R.B.	7"x9"	⅝"x6"
Total					8,140	1,450					

Rail has not been changed.

The record of removal of ties each year until 1922 inclusive is shown in the following table:

Kind	Number Placed	Number Removed											
		'13	'14	'15	'16	'17	'18	'19	'20	'21	'22	Total	Per Cent.
Untreated White Oak	760					76	82	98	152	101	47	556	73.4
Straight Creosote													
Red Oak	873								4	1		5	0.6
Other woods	252	1				3	5		1	4	8	22	8.7
Zinc-Creosote (Card)													
Red Oak	1,125					2	2	3	23	20	18	68	6.0
Otherwoods	1,219					1	2	7	69	54	61	194	15.9
Timber Asphalt (Petroleum Oil)													
Red Oak	1,001	15			3	50	50	104	202	91	227	742	74.1

*From Wood Preserving News, issued by the Service Bureau, American Wood Preservers' Association, March and April, 1923.

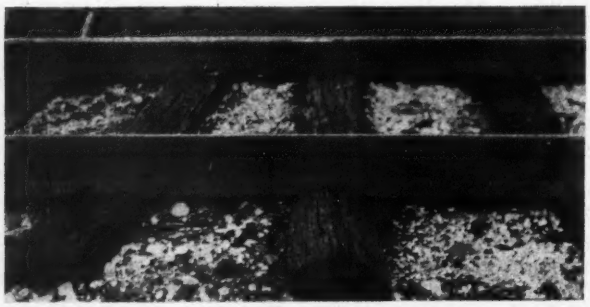
The traffic over these ties during 1911 and 1912 averaged 5,113,000 gross tons per year. The mean temperature for January was 30 deg. and in July 75 deg. The highest annual temperature was 96 deg. and the lowest annual temperature—5 deg. The rainfall was 40.4 in. annual temperature, 5 deg. The rainfall was 40.4 in. record was made of ties removed, and a notation of condition of those remaining, whether "badly defective," "partly defective," or "without defect."

Item	Untreated	Straight Creosote		Card Process		Timber Asphalt
	White Oak	Red Oak	Maple Gum Elm Beech	Red Oak	Maple Gum Elm Beech	Red Oak
Total ties in test	760	873	252	1125	1219	1001
Total removed in 12 years	556	5	22	68	194	742
	73.0%	0.6%	8.7%	6.0%	15.9%	74.1%
Total removed account decay	543	1	19	15	135	622
	71.7%	0.1%	7.5%	1.3%	11.0%	62.1%
Condition of remainder at end of 12th year:						
(a) Badly split or decayed	10.8%	0.5%	7.9%	5.2%	7.5%	10.7%
(b) Partly split or decayed	14.6%	8.7%	19.9%	10.9%	22.2%	14.2%
(c) Without defect	1.6%	90.2%	63.5%	77.9%	54.4%	1.0%
Estimated average additional life, item (c)	3 yrs.	7 yrs.	4 yrs.	5 yrs.	3 yrs.	3 yrs.
Total average life anticipated as a minimum	10.6 yrs.	18.7 yrs.	14.8 yrs.	16.2 yrs.	14.0 yrs.	11.0 yrs.

An estimate of additional life of remaining ties based on the above inspection combined with the twelve years

Red Oak Ties Treated With the Card Process

of their given life and with the average life of the ties removed to date gave the total average life anticipated from each kind and is shown in last item of the table above. It should be noted that the estimate of additional life of remaining ties was taken as a minimum, so that there is a reasonable expectancy that those groups which



Untreated White Oak Ties, Badly Checked

have a large number remaining in track will probably exceed the total anticipated minimum life shown. The minimum was used in estimating so as to be on the side of conservatism in projection of values of treated ties.

By combining the record of removals with the condition of remaining ties, as given in the foregoing table, there is derived the average minimum life to be anticipated from each group, and the relative value of the various

Red Oak Ties Treated With Creosote

kinds of treated and untreated ties. This is shown in the following statement:

Kind	Average Life (Minimum)		Economic Value (Costs as of Dec., 1922)	
	Years	% Incr.	Ann. Cost	Rating
Untreated white oak	10.6	.....	$0.208	100
Straight creosote—red oak	18.7	76	0.183	114
Straight creosote—other woods	14.8	40	0.194	107
Card process—red oak	16 2	53	0.182	114
Card process—other woods	14.0	32	0.183	114
Timber asphalt—red oak (petroleum oil)	11.0	4	0.222	94

Note: The expenses used in deriving at costs as of December, 1922, include the purchase, handling, treating and labor of renewing the ties.

The method of deriving the annual costs is given in the following statement, which also shows the items and prices used for comparisons:

COST OF MAIN TRACK CROSS-TIE IN TRACK AT PRICES OF DECEMBER, 1922

Kind	Purchase	Unloading	Treatment: Preservatives	Treatment: Labor	Renewing	Total
Untreated white oak	$1.20	$0.05	.....	.....	$0.35	$1.60
Straight creosote—Red oak	1.05	0.05	$0.40	$0.17	0.35	2.02
Straight creosote—Gum, maple, Beech, birch	0.90	0.05	0.40	0.17	0.35	1.87
Card process—Red oak	1.05	0.05	0.23	0.17	0.35	1.85
Card process—Gum, maple, Beech, birch	0.90	0.05	0.23	0.17	0.35	1.70
Timber asphalt—Red oak	1.05	0.05	0.13	0.17	0.35	1.75

COST OF PRESERVATIVES AS OF DECEMBER, 1922
(Absorption per tie being that of the Windsor-Blanchester test ties)

Straight creosote	2.7 gal. @ $0.15	$0.40 per tie
Card process—		
Creosote	0.84 gal. @ $0.15 —$0.126	
Zinc chl. (50% sol.)	3.5 lbs. @ $0.029—$0.102	$0.23 per tie
Timber asphalt	3.3 gals. @ $0.04	$0.13 per tie

ANNUAL COST

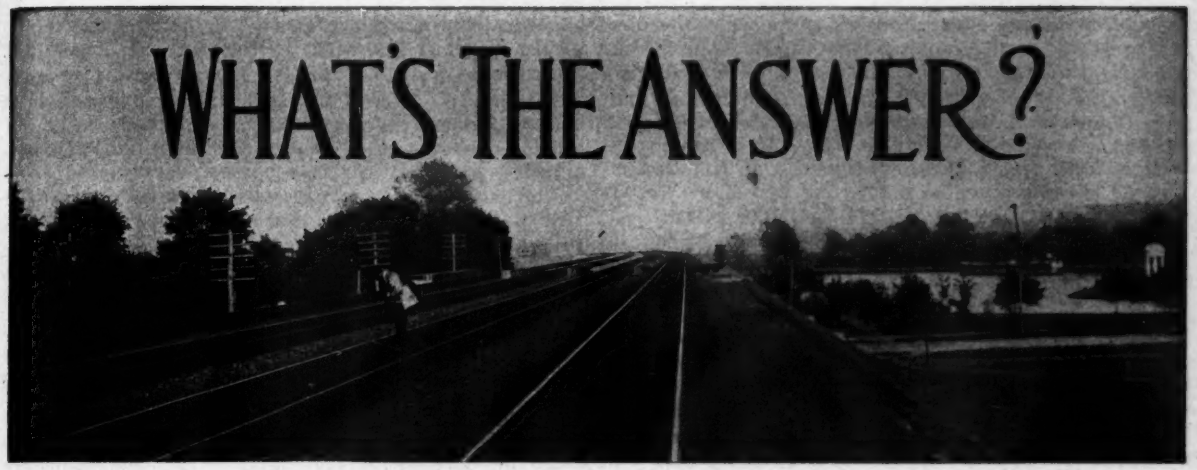
$$A = C\,\frac{(1+R)^n \times R}{(1+R)^n - 1}$$ where A = Annual cost, C = First cost, R = Rate of interest, n = Years' life

Instance—White oak, 10.06 years' life:

$$A = \$1.60\,\frac{(1.06)^{10.6} \times .06}{(1.06)^{10.6} - 1} = \$0.208 \text{ Annual cost.}$$

Ready to Build Moffat Tunnel—The Moffat Tunnel Act, which provides for the financing of a six-mile tunnel through the Continental Divide on the line of the Denver & Salt Lake Railroad by assessment on the property included in an improvement district served by this railway, was held constitutional in a decision of the Supreme Court of the United States last week. In December, 1922, the Colorado Supreme Court handed down a unanimous decision upholding the constitutionality of the act, in a friendly suit which was brought to test the validity of the bonds which are to be issued to finance the work. The case was then carried to the United States Supreme Court.

WHAT'S THE ANSWER?



This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

Answers to the following questions will be published in the September issue:

(1) *What advantage is to be gained by using treated wood for tie plugs?*

(2) *Where a trestle must be supported on exposed bed rock so as to preclude the use of pile bents, how should the frame bents be anchored to hold them in place?*

(3) *Under what conditions is the triplex type of pump to be recommended for railway service?*

(4) *When should rip rap be placed by hand rather than dumped?*

(5) *What are the relative advantages of surfacing track out of face with enlarged section gangs and with extra gangs?*

(6) *Why are not horizontal fender girders provided in through truss spans to protect the web members from derailed cars?*

(7) *To what extent is it practicable to prevent wooden tanks from leaking? What precautions are necessary?*

(8) *What objections are there to the seepage of water through concrete, other than the danger of frost action?*

Mechanical Agitation in Water Treating Plants

Where the mixing of chemicals and untreated water is accomplished by mechanical agitation, what is the most efficient speed of operation?

First Answer

The proper speed of operation for mechanical agitation of chemicals in water is a problem which must be determined for each individual water. The amount of agitation as well as the speed required will vary with the different ratio of incrusting chemicals customarily found. No definite rule can be established for this agitation which will meet all requirements and it is recommended that the individual waters be given laboratory tests before such installations are made.

R. C. BARDWELL,
Superintendent Water Supply, Chesapeake & Ohio, Huntington, W. Va.

Second Answer

Opinions differ as to the most efficient speed of agitators in water softening as well as to the length of time the agitation should be continued. Some waters require more violent agitation than others, in which case two sets of agitators are sometimes provided; the paddles intermeshing and rotating in opposite directions.

As a general rule the duration of the agitation is based upon time rather than speed of agitators, a common practice being to construct the downcomer with a capacity of one-third the hourly capacity of the softener, and agitation being provided for from one-half to two-thirds of the distance through the downcomer.

The purpose of agitation is thoroughly to mix the chemicals with the untreated water and in most cases agitation is completed when this has been accomplished. The strength of the chemical solution and its thorough mixing is a factor in determining the speed of agitators and time of agitation.

C. R. KNOWLES,
Superintendent Water Service, Illinois Central, Chicago.

Third Answer

The length of time that mixing by mechanical agitation should be continued depends on the temperature of the water and the amount of organic slime which it contains. Clean river or well water containing only calcium or magnesium can be thoroughly mixed with lime in about 20 min. in the summer time; but when the water is cold the mixing should be prolonged for at least 40 min. If the water is from a stream containing the juices of vegetation (like the Mississippi river and many other streams) mixing should be continued for at least one hour, and in some cases for an hour and a half. It is very important to the thorough and speedy settling of the precipitate, that the chemical work should all be done before the settling process commences.

In mixing chemicals and water by means of paddles

(or, indeed, by any other means) it is important that the mixing should not be so rapid or violent as to break the large particles of precipitate. I operate all my paddle shafts at a speed of 8 r. p. m., finding that this gives thorough mixing and does not break up the larger particles.

C. H. KOYL,
Engineer Water Service, Chicago, Milwaukee & St. Paul, Chicago.

The Long and Short Guard Rails

What are the relative merits of long and short guard rails opposite frogs?

First Answer

Guard rails on the turnout side of a switch should be of sufficient length to guide the truck until both truck wheels are well past the frog point. For a 12-ft. frog, a 15-ft. guard rail should be used. If the other side is on straight track, 10 ft. guard rails are ample if the track is kept in line and surface. This distance is not meant to include the ends that are bent out so as to admit filler blocks and to keep wheel flanges from striking the rail ends. It is meant rather, that there should be not less than 10 and 15 ft., respectively, of straight rails to guide the wheel flange through the frog, making over all, about 12-ft. 6-in. and 17-ft. 6-in. of guard rail.

Switches will cause less trouble if the gage is widened to 4 ft. 8¾ in. on the main line (if straight), and to 4-ft. 9-in. on the turnout. With this spacing the wheel fillets do not ride the rail as much, and as a result frogs, points and rail wear more evenly and last longer.

L. FLYNN,
Section Foreman, Galveston, Harrisburg & San Antonio, Ysleta, Tex.

Second Answer

Short guard rails are fully as effective as the longer ones in preventing wheels from striking or passing to the wrong side of frog points, and under certain conditions more so—and it will be conceded that this is the principal function of such equipment. Furthermore, assuming the flared ends are of the same size, short ones will do their work with as little disturbance to passing cars, for it is the shape of the flares rather than the length of flangeways that is of most importance in preparing wheels for passage through the frog. In the seeming interest of shortening guard rails the importance of easy flares has often been overlooked, with the result that the flares are often made more abrupt than is desirable.

Under certain conditions the use of long guard rails is desirable; a principal one being that of saving the frog from excessive wear from the wheel flanges. Wear from flanges on manganese frogs when used with short guard rails may at times be the greatest cause of deterioration.

Important savings result from the use of short guard rails where the conditions permit their use. First costs for labor and material are obviously smaller, but of more importance are the savings in maintenance and the greater assurance of continuity in the effectiveness of the installation resulting from the lessened resistance to the passage of wheels through the flangeway—the forces tending to overturn the guard rail or spread the flangeway being least when the flangeway is shortest. A costly feature of guard rail maintenance where frequent readjustments are necessary is in the adzing and respiking of switch ties.

Frequently guard rails, whether long or short, are placed with their mid-point opposite the point of frog. More often than not this is not the best arrangement. A short guard rail should be placed with its mid-point opposite that part which is halfway between the point of the frog and the throat of the frog. A long guard rail, under ordinary conditions, should be placed with its mid-point opposite that part of the frog which is halfway between its extremities. Guard rails so placed provide the maximum protection which their lengths afford.

The quite general use made of short guard rails on the Belt Railway of Chicago for a number of years has resulted in a large saving. One situation will illustrate this. In one of our yards that was given quite substantial overhauling eight or nine years ago, the long guard rails then in use were cut in two, and the ends flared out with a jim-crow. The shortened guard rails were then reinstalled, using a crossing filler with three or four bolts to make the fastening. These short guard rails and many of the original bolts are still in service. The old guard rails, as I recall, were 15-ft. long, thus making each of the short rails approximately 7-ft. 6-in. long.

E. D. SWIFT.
Engineer Maintenance of Way, Belt Railway, Chicago.

Painting Screens

How often should screens be painted and what is the best kind of brush to use?

First Answer

Screens should be painted at least once a year. This should be in the spring when as a general rule the necessary repairs and renewals are made. The best brush to use for this work is a two or three inch flat beveled point brush, the size to be governed by the size of screens to be painted.

H. E. CONRAD
Foreman Painter, Pennsylvania, Huntington, W. Va.

Second Answer

Screens should be given a thin coating of paint when they are first made or bought, as the coating found on a new screen will not protect it from the weather. Also when a light weight of screening wire once starts to rust it means the end of the screen. If given one coat when new, however, the screens should not require painting again for at least two years.

For applying the paint a bristle brush should be used, with the paint well worked out. Unless this is done the mesh will become filled with paint, in which condition the wire will crack.

MARTIN KANE,
Superintendent of Building, Delaware & Hudson, Albany, N. Y.

The Limit of Dropping Concrete

Is the dropping of concrete from considerable heights objectionable, and if so, what is the practical limit?

First Answer

While we have no experimental data as to the height concrete can be safely dropped, it is our general practice when depositing such concrete to lower the buckets to the surface of the concrete before dumping. In no case are we permitting a drop of over five feet. Where a higher drop has been used we find there is a tendency to separate the coarser aggregate from the mortar. Furthermore, the higher drop has a tendency to disturb the concrete already deposited. One other objection to the dropping of concrete is the spattering of the forms, with a resultant bad surface on the concrete when they are removed.

J. J. YATES,
Bridge Engineer, Central of New Jersey, Jersey City, N. J.

Second Answer

The distance concrete is dropped should be held at the absolute minimum allowable in connection with local con-

ditions. In my opinion, the maximum distance should range from three to eight feet, depending upon the consistency and the mechanical mixture of the concrete.

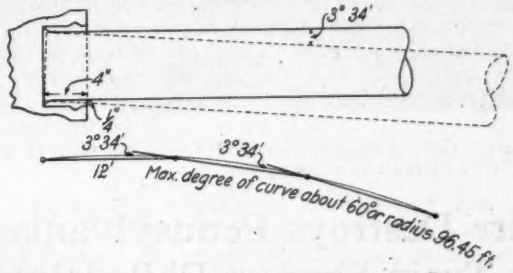
The concrete should be distributed by a telescopic spout when the necessary distance between the end of the chute and the ground is sufficient to cause a segregation of the coarse concrete directly under the chute. The consideration of this feature is very essential to the construction of good concrete.

C. P. RICHARDSON,
Engineer Track Elevation, Chicago, Rock Island & Pacific, Chicago.

Laying Pipe to Curves

What is the sharpest curve that may safely be made when laying bell and spigot pipe of different sizes?

H. B. Blake, engineer water supply, Canadian National, writing from Winnipeg, Man., submits the accompanying sketch to show his general practice in laying 6-in. cast iron pipe to curves, a practice which he reports has



The Method of Determining the Maximum Curvature

always worked satisfactorily. It will be noticed that Mr. Blake allows a ¼-in. deflection from a straight line measured at the bell end, thus leaving ¼ in. for calking. Since the joint is 4 in. long, this gives a deflection angle of about 30 deg. 34 min. for pipe 12 ft. long. Applying the formula $R = \frac{C}{2 \sin \frac{I}{2}}$ for railroad curves, in which R is the radius of the curve, C is the chord (in this case 12 ft.) and I is the central angle subtended by the chord, Mr. Blake thereupon finds the maximum radius of curvature for 6-in. pipe to be about 96 ft. and the degree of curve about 60 deg.

It is thus seen that a considerable curve may be allowed in laying cast iron pipe. This curvature will differ for different sizes of pipe in accordance with the allowable play in the joint. Knowing the dimensions, however, which may be obtained from specifications, the maximum curvature may readily be determined according to the method followed by Mr. Blake, making sure to allow sufficient room at the joint for effective calking. In practice it is seldom that sharp curves need be made in pipe lines and it is recommended that they be avoided whenever possible.

Evidence of Overstress in Steel Bridges

What are the signs of overstress in a steel bridge that may be most readily detected by inspection?

Overstress in a steel structure or the straining of certain parts close to the elastic limit tends to cause excessive deformation or stretching of the members as indicated by a general loosening of the parts. This is most commonly evidenced by loose rivets, which may be detected by tapping them or by the presence of rust streaks extending downward from the rivet heads. However, an examination for such evidences of distress in a steel bridge can under no circumstances be assumed to take the place of a thorough investigation of the stresses in the various members as determined by actual calculations.

Inspection serves a valuable purpose in supplementing such calculations in determining the physical condition of the bridge, particularly in ascertaining if all parts are serving their purpose properly. For instance, if the tapping or shaking of the eye-bar in a chord shows that one or more of them are loose, while others are taut, it is apparent that the load is not being distributed uniformly among them. It may even happen that one of the eye-bars is carrying the load alone and is, therefore, stressed much higher than the office calculations would indicate. A loose counter may indicate poor adjustment, but on the other hand it may be an evidence that the main diagonal in the same panel is stretching as the result of overstress. Excessive deflection or vibration are also evidences of unsatifactory condition that should be thoroughly investigated.

Introducing Colors in Stucco Work

To what extent is it practical to introduce colors in monolithic concrete or portland cement stucco? How is this color introduced into the concrete?

Practically any desired color can be obtained in concrete or portland cement stucco. Three methods are in common use, viz.: (1) the addition of mineral coloring pigments, (2) the selection and use of colored aggregates, and (3) a combination of mineral coloring pigments and colored aggregates.

All three methods are used in portland cement stucco and in ornamental concrete products such as concrete trimstone, concrete block, concrete brick or roofing tile. To save expense the coloring material is only used in the final or finish coat of stucco, and is usually applied only as a facing mixture ⅛ in. to ½ in. thick on concrete products.

If the first method is adopted, only mineral coloring materials should be used, as others are apt to fade and give a splotched appearance eventually. Deep shades are obtained by using larger amounts of the pigment, but in no case should the coloring material exceed 10 per cent of the cement by weight, because larger amounts may seriously decrease the strength of the stucco. The color also depends, of course, on whether white or gray portland cement is used. The following table of colors may be found useful.

Color Desired	Commercial Name of Coloring Material	Amount Required Per Bag of Cement Light	Dark
Grays, blue-black and black.	Germantown lampblack	½ lb.	1 lb.
	Black oxide of manganese	1 lb.	2 lb.
Blue	Ultramarine blue	5 lb.	9 lb.
Brownish-red to dull brick red.	Red oxide of iron	5 lb.	9 lb.
Bright red to vermilion	Mineral turkey red	5 lb.	9 lb.
Red sandstone to purplish red.	Indian red	5 lb.	9 lb.
Brown to reddish brown	Metallic brown (oxide)	5 lb.	9 lb.
Buff, colonial tint and yellow.	Yellow oxide	5 lb.	9 lb.
Greens	Chromium oxide	5 lb.	9 lb.

Greater intensity of shade can be secured by mixing the materials longer than ordinarily. The application of a solution of magnesium fluosilicate is said to be effective in setting the color and checking a tendency to fade. The coloring material should be mixed with the sand until the mass is uniform in color, then the cement should be added and the mass thoroughly mixed again, after which the water is added.

In stucco work pleasing color effects are often secured through the careful selection of aggregates. After allowing a proper interval for hardening, the finish coat is brushed or scrubbed so as to remove the thin surface film of cement and expose the aggregate. In case the stucco has hardened too far, a dilute solution of hydrochloric acid can be used, but it must be washed off at once. In "spatter-dash" work, the colored aggregates are thrown against the finish coat and thus partially embedded in it. In either method the final color effects depend almost entirely on the color of the aggregates.

In terrazzo work a mixture of cement and chips of marble or other stone, to which sand is sometimes added, is spread on the floor, wainscoting or mould (in the case of precast tiles). Additional chips are then strewn on the surface and rolled in. After the surface has hardened sufficiently it is ground down either by hand or by machine, thus exposing a large percentage of the chips. Many specifications require that the chips compose at least 85 per cent of the finished surface. Terrazzo work offers almost unlimited possibilities for attractive color effects through the use of colored marbles, coloring materials in the cement matrix, and either white or gray portland cement. Many railway staions have terrazzo floors; among others the Grand Central Terminal in New York. The lower lobby of the North Western Terminal in Chicago is floored with terrazzo tile.

In monolithic concrete, color effects are sometimes obtained by leaving the surface somewhat rough and applying a coat of portland cement stucco. In such cases care must be taken to get a good bond between the concrete and the stucco. In other cases a special facing mixture is placed simultaneously with the remainder of the concrete, a movable metal plate being used to keep the two mixes separate while they are being placed. After removal of the forms the surface can be brushed or scrubbed as described above to expose the aggregate if desired.

Small concrete products are often colored by dipping them in a tank containing a coloring solution. This solution penetrates the surface a slight distance and in addition to imparting color, tends to seal the pores and make the surface more watertight. Similarly small concrete products are often dipped into a dilute acid, both to remove the surface film of cement and to expose the aggregate.

Some wonderful colored concrete work has been done by John J. Early of Washington, D. C., who has worked out certain methods to a high degree of refinement in cooperation with Mr. Pearson of the U. S. Bureau of Standards.

D. A. TOMLINSON,
Manager Railways Bureau, Portland Cement Association, Chicago.

Taking Up Abandoned Track

How can abandoned tracks, for instance, three or four miles of ballast pit tracks, be taken up most economically?

First Answer

If the tracks to be taken up consist of a system of parallel tracks spaced from each other within the working radius of a locomotive crane, such a machine can be used advantageously in the removal of such tracks.

Where the trackage consists of a single track the case is somewhat different. Several years ago we had occasion on the Big Four to take up several miles of an abandoned single main track. In connection with this work several methods were tried, using among others a locomotive crane. It was found that the cheapest way of taking up the track and loading the rail was to handle the rails by hand; loading them over the end of a flat car on which was placed a dolly. In this case the old ties were not salvaged, as they were not worth picking up.

P. HAMILTON,
Assistant Chief Engineer, Cleveland, Cincinnati, Chicago & St. Louis Railway, Cincinnati, Ohio.

Fire Destroys Pennsylvania Train Shed at Philadelphia

A SEVERE fire practically destroyed the large train shed of the Pennsylvania System at Philadelphia, Pa., on June 11. The fire spread with such rapidity that little could be done. Three locomotives and 15 cars were caught in the structure and burned with it. The loss is estimated at $1,000,000.

The train shed was approximately 600 ft. long with an arch roof structure measuring 303 ft. 7½ in. out to out of trusses and having about 100 ft. clearance. It was covered with timber overlaid with composition roofing and glass sash. The floor system was of steel girder construction supporting timber platforms, ties and stringers for 16 tracks. All spaces between the platforms and the rails were covered with planking overlaid with asphalt waterproofing. The space underneath the floor system was utilized for baggage and mail rooms, power plant,

A Number of Cars Were Abandoned in the Station

Workmen Started Repairs Before Fire Was Out

etc., with a ceiling in the form of corrugated sheet iron suspended from the girders. The fire started and apparently spread throughout the structure in this open space between the top of the floor system and the metal ceiling of the sections underneath.

Two streets, Fifteenth and Sixteenth, pass under the train shed and it was between these two streets that the greatest damage was done. All woodwork and timbering were completely burned out and the steel work badly twisted and warped, and sagged to practically complete destruction. No arches collapsed and none of the abandoned equipment fell through, although many of the girders were so badly warped that this could easily have occurred. The baggage, mail, power plant and other rooms underneath were practically destroyed.

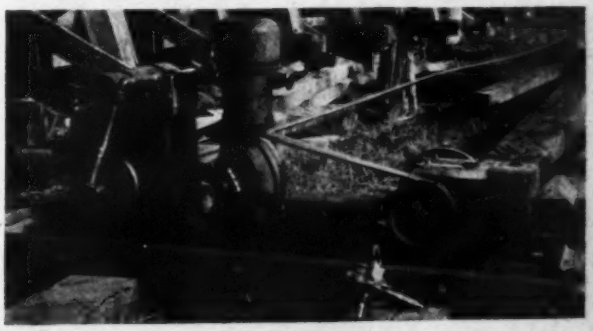
It was the plan to get the station back into service as quickly as possible and for that reason the existing structure was used wherever possible. Warped and twisted girders were cut out and replaced by timber trestles; old girders were reinforced with timber bents. The old arches, while safe so far as operation underneath is concerned, are of no further value and will be dismantled as soon as a traveler can be erected.

Air Boring Machines Reduce B & B Costs on the Great Northern

THE possibilities that lie in the use of compressed air and the internal combustion engine as a means of facilitiating the performance and reducing the cost of various kinds of work incident to the maintenance of way and structures on railways have recently made themselves apparent in a new field of operation in the Great Northern's adaptation of such equipment to wood boring in its bridge and building department.

This road, like others operating through the western part of the country, has a great many timber bridges, tunnels, coal docks and similar structures, in connection with the building and upkeep of which it is necessary to do considerable boring work preparatory to the driving of drift bolts, line spikes, lag screws, etc. In the past this work was done by hand, a slow process at best and expensive in view of the amount annually required.

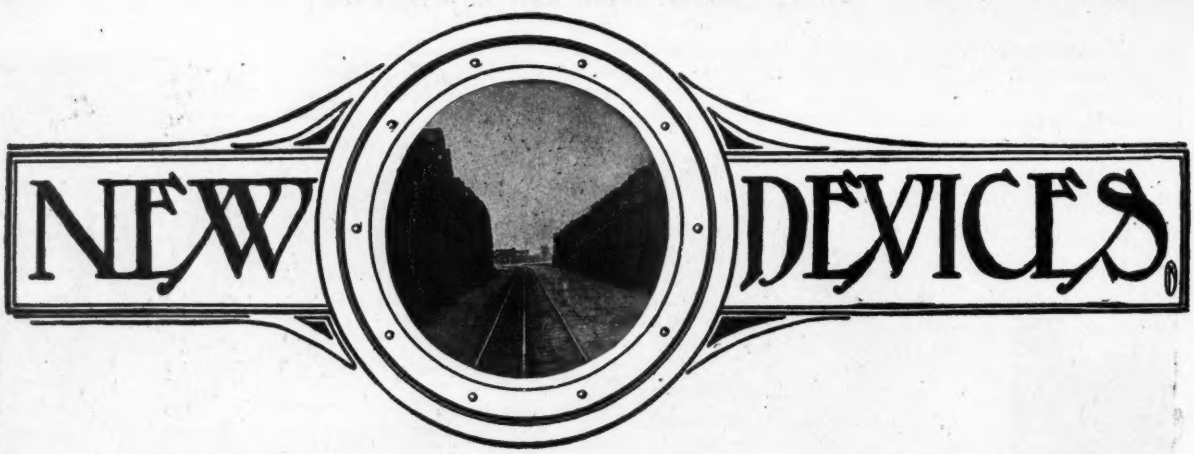
Thinking it possible to effect substantial improvement in the conditions under which this work was being done, the Great Northern decided to experiment with compressed air and accordingly equipped certain bridge and



The Compressor Unit Set Up for Boring Work at a Long Trestle Bridge

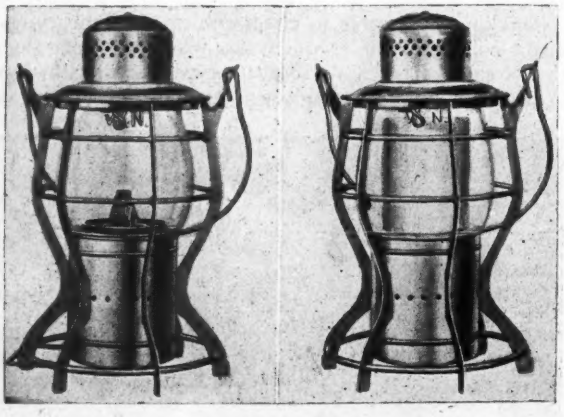
building crews with the type of outfit shown in the illustration. Each unit consists of a belt-driven air compressor and a 10 hp. Woolery internal combustion engine, both of which are mounted on timber skids, well braced and securely bolted for portability. One outfit complete weighs 800 lb. and can be loaded by hand on a push car, which facilitates transferring it from one job to another. At the present time the machines have been provided on three divisions and do all boring in connection with bridge work, including boring for drift bolts and line spikes, and also the work of placing lag screws with which bridge guard rails are attached to the ties.

The results have been very satisfactory. As an example of the work accomplished by them, the statement is made that 725 lin. ft. of boring was effected on a 554-ft. trestle bridge at a cost of but 0.6 cents per lin. ft. of hole, as compared with an estimated cost of 12½ cents for work done by hand, the figures being based on working one-half first and one-half second class carpenters.



A Novel Combination Lantern

In view of the large number required and the need for both red and white light lanterns, considerable interest is attached to a new type of lantern recently manufactured by the V & N Lantern Company, Inc., New York. By a simple arrangement of a lever controlling the movement of a disappearing red globe, the lantern can be converted within a few seconds to give either a strong red or a white light as desired. This unit is manufactured, either entirely from cold rolled steel or from brass. The top, and



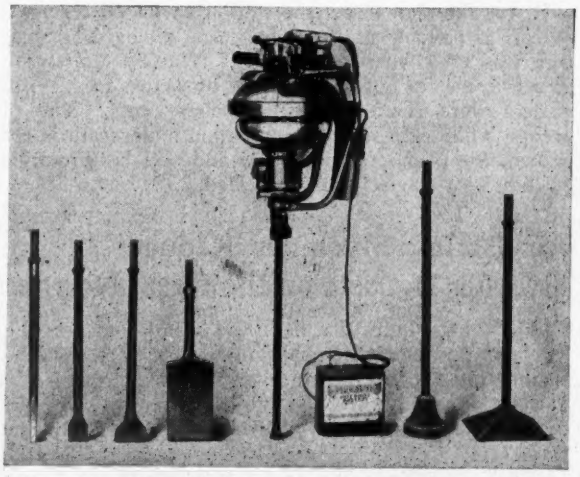
The Lantern as Ordinarily Used. Right, The Red Globe in Position

likewise the lower shell as well, are pressed from one piece, thus obviating any seams. The guard frames and guard rings are of heavy construction and are spot welded or brazed, according to the materials, to each other. The lower case, or shell, houses a coil spring and a threaded metal ring into which a cylindrical red globe is screwed in a manner similar to the placing of a cap on a mason jar. A U-shaped lever attached to this ring pulls the glass down, compressing the spring, and is locked in this position by swinging the lever to one side, where it engages with the base of the frame. When released, the glass is brought into its upper position, where it is held solidly in position. The oil font is made of brass and is also pressed from one piece. It is designed to slip easily into the base of the lantern in any position, where, when in place, the wick control engages with the top of the well in such a manner that when the font is rotated from the bottom, the wick is turned up or down. The top is equipped with a large hinge having a renewable pin and locks down with a heavy spring. The handle fastens directly to the guard frame and is designed to catch in an upright position when that is desired. Recent tests of the lantern by trainmen on an eastern railroad showed that the lantern could not be blown out from the direct blast of the air at high speeds, the maximum tried being about 50 miles an hour. Either signal oil or kerosene burners are used.

An Unusual Type of Portable Drill or Tamper

An unusual and interesting new type of portable drill or tamper has been recently developed which is practically self-contained and operates with gasoline as a fuel. This device consists of a small, light-weight gasoline motor equipped with handles, built integral with a tamping mechanism to which may be attached a variety of tools for street opening work, drilling rock, ramming back fill, tamping ballast, etc. The mechanical principles of this unit combine the action of the air hammer and a gasoline engine in such a manner that there are but two moving parts, the hammer piston and the fly wheel assembly, no crank-shaft or connecting rod being employed.

The blows of the hammer piston are the power strokes of the gasoline engine which is of the two-cycle type running at approximately 1,800 r. p. m. and thus giving that



The Portable Unit Weighs 70 Lb. and Operates on Gasoline

many impacts per minute. A gasoline mixing valve is used for carburation in order that the drill may be worked at any angle and in order that the motor may continue to run at full speed when lifted or moved. Special alloys of 210,000 lb. per sq. in. tensile strength are

used in the impact members. The entire unit weighs 70 lb. and is manufactured by the Pennsylvania Gasoline Drill Company, Philadelphia, Pa.

A Claw Bar Designed to Save Time

A RECENT addition to the equipment for use in railway maintenance is a claw bar, which is claimed to pull spikes vertically and save at least 40 per cent of the time ordinarily required for this work. The ability of the bar to fulfill these claims is said to be accomplished by the special design of the heel, which is made full enough to pull any spike without the use of extra "bait" or blocking to complete the withdrawal. The effect of pulling spikes vertically is to eliminate their bending and to cause less damage to the tie in the pulling process. In addition to the two points mentioned, the bar is designed

The Bump Claw-Bar in Place for Extracting Spikes

to keep the end at least 15 in. above the top of the opposite rail when the spike is pulled, thus reducing the possibility of trackmen having their fingers caught between the bar and the rail. The bar is an invention of W. A. Bump, supervisor, Boston & Albany, Pittsfield, Mass., and is being manufactured by the Verona Tool Works, Pittsburgh, Pa. It weighs about 30 lb.

A General Utility Steam Crane

THE McMyler-Interstate Company, Cleveland, Ohio, has undertaken the manufacture of a new crane which it has designed to meet conditions calling for a machine capable of performing a wide variety of operations with equal utility. The machine is a steam-operated crawler type machine and is the smallest of the several types of cranes built by the company. In keeping with the purpose underlying the design, the crane will operate a clam shell or an orange peel bucket, a drag line bucket, a lifting magnet, a steam shovel, a pile driving hammer or back filling attachment, or a skimmer scoop. It will handle a 30, 35, or 40-ft. boom. It develops a single line pull of 10,000 lbs., will make five complete revolutions per minute, will climb a 30 per cent grade without load, will travel under its own power at the rate of 100 ft. per minute, steers in any direction without the assistance of a ground man, will travel in any direction regardless of the position of the boom, and will transmit full power to the crawlers while steering.

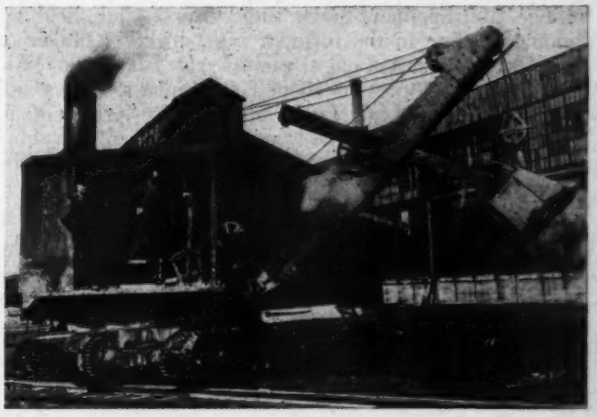
The illustration shows the crane arranged for steam shovel operation, the equipment for this purpose consisting of a 17-ft. 6-in. boom, with a 12-ft. 6-in. dipper handle carrying a ¾-yd. dipper. Thus equipped, the machine will cut from within 8-ft. 4-in. of the center of rotation of the crane to a radius of 24-ft. 2-in., and from a distance of 4-ft. 1-in. below the ground line to 8-ft. above it. For use as a crane, the machine has the following lifting capacities at various radii, the ratings given conforming to the recently established standards of the Locomotive Crane Manufacturers' Association:

Radius Ft.	Load in Pounds, 30-ft. Boom	Load in Pounds, 35-ft. Boom	Load in Pounds, 40-ft. Boom
10	20,000	.....	.....
12	20,000	20,000	20,000
15	17,100	17,000	16,800
20	11,600	11,500	11,300
25	8,800	8,600	8,400
30	6,900	6,700	6,600
35	.....	5,500	5,400
40	.....	.....	4,500

For earth handling work, the available line pull of the machine is such that with a 40-ft. boom, a one-yard bucket may be operated at radii up to 35 ft., in which service the hoisting speed, as has been mentioned, is 200 ft. per minute. Excavating and back-filling work is accomplished by the use of an auxiliary hoisting drum with which the machine is provided. The fact that the boom does not have to be pointed in the direction of travel during operation makes the machine speedy and convenient for building erection work, in which a number of the cranes are now being used.

The crawler treads permit the train to climb readily over railroad tracks or through sand and mud and up and down grades. While introduced primarily with a view to its use as a crawler crane, the machine is so designed that it can be mounted on tractor wheels or on standard gage trucks for operating on tracks.

The operations of this crane are actuated by a double cylinder, non-reversing steam engine, depending on right and left hand clutches instead of link motions and reversing valves for raising and lowering the boom for slewing and propelling.



The No. 2 McMyler Crawler Crane Equipped with a ¾-Yard Shovel

To afford accessibility for adjustments and repairs, the crawler and sprocket shafts are removable simply by the removing of a pin from the tread. By taking off one end nut the transverse drive shaft and sleeve may be detached. Also the slewing shaft can be lifted from its bearing by removing only the two trunnion caps, while only two easily accessible bolts need unscrewing to detach the cams of the friction shaft. The friction linings may be renewed without disturbing any of the mechanism and the boom hoist mechanism is entirely independent.

The overall length of the machine is 16-ft. 7-in., the width 8-ft. 10-in., and the height 15-ft. 2-in. The operating weight is 55,000 lb., creating a soil pressure of 10 lb. per square inch.

Roadmasters' Association

The officers and members of the Executive committee and the chairmen of all committees will meet at the Hotel Sherman, Chicago, at 10 a. m. on July 7, to plan for the next convention and to receive and consider the reports of committees.

Bridge and Building Association

One report has been completed and others are being rapidly rounded into shape for presentation at the thirty-third annual convention which will be held in Seattle, Wash., on October 16-18. A special train will leave Chicago on Saturday evening, October 6, over the Chicago, Burlington & Quincy, the Denver & Rio Grande Western and the Union Pacific, stopping en route to inspect the new shops of the Burlington at Denver, the realinement and grade reduction on the Denver & Rio Grande Western at Soldier Summit, Utah, and the reconstruction of the trestle across Salt Lake on the Southern Pacific line west of Ogden, Utah. Three days will also be spent in the vicinity of Portland and Tacoma studying logging and saw mill operations incident to the production of bridge and building timber. The party will arrive at Seattle on Monday evening, October 15.

The Metropolitan Track Supervisors' Club

The Metropolitan Track Supervisors' Club held its annual meeting in the form of a get together dinner at the Hotel Nassau, Long Beach, Long Island, on June 9. There were present about 200 members, guests and their wives. George Le Boutillier, vice president in charge of operation on the Long Island, presented a short talk following the dinner in which he outlined the history and progress of the Long Island railroad.

Central Railway Club Has Maintenance Meeting

G. L. Moore, engineer maintenance of way of the Lehigh Valley, was the principal speaker before the second interim meeting of the Central Railway Club at the New Hotel Statler, Buffalo, N. Y., on June 14. The subject of Mr. Moore's talk was Economy and Efficiency in Maintenance of Way and the Method of Laying Rail and Cleaning Ballast with a Locomotive Crane.

American Railway Engineering Association

The Board of Direction adopted a resolution on June 19 demanding that the United States Department of Justice arrange for the prompt trial of those engineers and contractors in the construction department of the United States Army who were indicted for alleged irregularities in the building of the cantonments during the early months of the war.

Professor A. N. Talbot and the members of the staff of the Committee on Stresses in Track will make a series of tests early in July on the stresses in track created by electric locomotives on the electrified lines of the Chicago, Milwaukee & St. Paul in Montana, Idaho and Washington.

The association has transmitted to the American Engineering Standards Committee for standardization, its specifications for steel railway bridges and for movable railway bridges.

The Material Market

MODERATE decreases in demand and further softening of premium prices for immediate delivery point to a continuation of the present prosperity of the iron and steel industry on a more conservative level. As a consequence, only minor reductions in price may be expected in the near future. The continuation of production in large volume indicates that orders may be filled with reasonable promptness. The demand also continues active. There has been some reduction in the volume of structural steel awards as well as in wire products sales, but in the case of track material, the demand is strong. Orders for rail in the middle west during the late spring and early summer have totaled 500,000 tons, while business in track fastenings is also on an encouraging basis. One new development is the recent announcement by one of the eastern rail manufacturers to the effect that a premium of $2 per ton would be required on all rail weighing 110 lb. or more per yard. The following table of prices covers items of interest to maintenance of way men.

	Prices in Cents Per Pound			
	May 20		June 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	3.15	3.25	3.15	3.25
Track bolts	4.25 to 4.50	4.25	4.25	4.25
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.55 to 2.60	2.60	2.60 to 2.75	2.60
Tie plates, iron		2.85		2.85
Plain wire	2.75	3.09	2.75	3.09
Wire nails	3.00	3.34	3.00	3.34
Barbed wire, gal.	3.80	4.14	3.80	4.14
C. I. pipe, 6 in. or larger, per ton.		$60.20		$60.20
Plates	2.50 to 2.60	2.60 to 2.94	2.50	2.60 to 2.80
Shapes	2.50 to 2.60	2.60 to 2.94	2.50	2.60 to 2.70
Bars, soft steel	2.40 to 2.50	2.50 to 2.84	2.40	2.50 to 2.60
Open hearth rails, per gross ton f. o. b. mill				$43.00

The scrap market continues weak and further reductions in price will be noted in the table below. These quotations are all fully $5 per ton below those quoted in March.

	Prices Per Gross Ton at Chicago	
	May	June
Relaying rails	$32.00 to $35.00	$32.00 to $35.00
Rails for rerolling	21.00 to 21.50	19.00 to 19.50
Rails less than 3 ft. long	22.50 to 23.00	20.00 to 20.50
Frogs and switches cut apart	19.00 to 19.50	17.50 to 18.00
	Per Net Ton	
No. 1 railroad wrought	21.00 to 21.50	15.50 to 16.00
Steel angle bars	19.50 to 20.00	17.00 to 17.50

There is a further tendency toward softness in the lumber market as indicated in the table below. For Southern pine, a number of reductions have taken place. The volume of orders on hand shows considerable contraction during the last three months. While only minor changes have been noted in the Douglas Fir prices there has been some falling off in the orders on hand for rail shipments, a condition which may be reflected in further changes in prices.

Southern Pine Mill Prices

	May	June
Flooring, 1x4, B. and B. flat	$53.05	$50.42
Boards, 1x8, No. 1	43.25	40.85
Dimension, 2x4, 16, No. 1 common	31.95	30.55
Dimension, 2x10, 16, No. 1	32.90	31.35
Timbers, 4x4 to 8x8, No. 1	31.35	30.55
Timbers, 3x12 to 12x12, rough		51.49

Douglas Fir Mill Prices

Flooring, 1x4, No. 2, clear flat	42.00	40.00
Boards, 1x6, 6x20, No. 1, common	19.50	18.50
Dimension, 2x4, 16, No. 1, common	23.50	19.50
Dimension, 2x10, 16, No. 1, common	21.50	21.50
Timbers, 6x6 to 8x8, No. 1, common	24.00	24.00
Timbers, 10x10 to 12x12, rough	26.00	26.00

The prices for portland cement indicated below are on the basis of the price per sack instead of the price per barrel, the quotations being for carload lots not including package. These prices are substantially one-fourth of the prices per barrel previously quoted in this column.

Chicago	$0.55	Duluth	$0.53½
Cincinnati	.63½	Milwaukee	.59¼
Davenport	.60¾	Minneapolis	.59¾
Detroit	.62	Pittsburgh	.56

General News

By a law passed by the legislature of New York and signed by the governor on June 2, all railroads within the limits of New York city are required to abolish the use of steam locomotives within the city by January 1, 1926.

C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific, has been elected president of the Western Society of Engineers, Chicago; E. T. Howson, editor *Railway Engineering and Maintenance,* first vice-president, and G. W. Hand, assistant to the president, Chicago & North Western, treasurer for the year ending June 1, 1924.

Regular train service was restored on more than 75 miles of the Chihuahua division of the Kansas City, Mexico & Orient on June 2, after a discontinuance of 11 years owing to the troublesome conditions in Mexico. The line was put into condition for re-use with the assistance of the Mexican government, and will have further federal aid in completing the repairs on the remainder of the division.

The Southern Pacific between Portland, Ore., and San Francisco, Calif., was cut in two by the burning of the timber lining and by the caving in of both ends of a 400-ft. tunnel on the Shasta route near Coram, Calif., on May 21, necessitating the construction of a temporary track around the tunnel, and the discontinuance of operations over the line until the completion of the detour a week later.

The number of employees reported by class 1 steam roads of the United States for March, 1923, was 1,816,479, an increase of 246,321, or 15.7 per cent, over the number reported for the same month of 1922, and an increase of 32,924, or 1.8 per cent, over the number for February, 1923, according to the statistics of the Interstate Commerce Commission. The total compensation in March, 1923, was 17.9 per cent greater than in March, 1922.

About 10 per cent of the total railway fuel consumption is for railway power houses, heating shops, and roundhouses, for pumping plants, coaling stations and for other miscellaneous purposes, according to a paper presented for the International Railway Fuel Association by R. F. Toogood. This 10 per cent amounts to about 17,000,000 tons a year, about 25 per cent of which, it is claimed, can be saved by proper design and supervision.

The Great Northern has completed and placed in service an ore dock at Duluth, Minn., one of the noteworthy features of which is the elimination of sand-filled cribs in the new dock foundation, and the use of batter piles driven at 30 deg. with the vertical, to assist in resisting lateral forces upon the dock such as would result from the impact from moving boats in adjacent slips. The dock carries 350 ore pockets of 350 tons' capacity each.

A national conference on the valuation of American Railroads, called by Senator La Follette, was held in Chicago on May 25 and 26, in which over 100 governors, senators, congressmen and labor leaders interested in promoting government ownership of railroads participated. A permanent organization was formed of a political character, through which it is intended to correct various alleged shortcomings of the Interstate Commerce Commission in establishing railway valuation, and otherwise to investigate and take such action regarding "other aspects of the transportation problem as may be found advisable to protect and advance the public interest." It was generally conceded that the underlying objective of the conference and of the organization established is to set in motion a campaign for government ownership, which it is reported, will be made an issue in the next presidential campaign.

Robert W. Hunt, president of Robert W. Hunt & Company, Chicago, was the recipient of the Washington award presented by the Western Society of Engineers, acting jointly with the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers and the American Institute of Electrical Engineers. The award, which is the second made thus far, was presented to Mr. Hunt for "pioneer work in the development of the steel industry and for a life devoted to the advancement of the engineering profession."

The American Society of Civil Engineers will hold its fifty-third annual convention at the Drake Hotel, Chicago, on July 11-13. The program will be devoted to railroad transportation and terminals. Among the speakers will be John W. Kendrick, chairman, International-Great Northern; Charles A. Morse, chief engineer, Chicago, Rock Island & Pacific, and Edwin F. Wendt and John S. Worley, formerly members, Engineering Board, Interstate Commerce Commission. The convention will be called to order by H. R. Safford, vice-president, Chicago, Burlington & Quincy, and its sessions will be presided over by C. F. Loweth, chief engineer, Chicago, Milwaukee & St. Paul, and president of the society.

In a report made to the Interstate Commerce Commission by the Bureau of Railway Economics in connection with the investigation being made into the adequacy of locomotives and cars owned by railroads, it was shown that on the basis of returns from 143 companies, operating 227,199 miles of line, the railroads' authorized expenditure for additions and improvements to railway property down to about the first of April amounted to approximately $1,108,672,000. Of this total $432,000,000, or 39 per cent, represents improvements to roads, and of this amount 30 per cent, or $122,000,000, is for additional track and track improvements, including $57,000,000 for heavier rail. The authorizations reported include all carry-overs from 1924, namely, amounts authorized in 1922 for improvements, but not charged into the accounts for that year because of the incompletion of the work. These authorizations represent 2½ times the expenditures made for 1922.

In the final report of the Conference committee of the American Railway Association, created to cooperate with the United States Coal Commission in studying the underlying causes for coal shortages, it was shown that in 1921, there were 8,038 mines, exclusive of wagon mines, in operation, which is an increase of 38 per cent over the number in 1910, while there was no increase in production. This means, the report says, that the railroads were called upon to divide equipment and other transportation facilities among 2,221 more mines than would have been necessary if the average production per mine had been maintained on the 1910 basis. It is also shown that on the basis of cars ordered by mines in 1920 in excess of the actual requirements for coal, the railroads would have been forced to spend not less than $2,000,000 in additional facilities to meet the demands of the bituminous coal industry in that year, as expressed by the mine's requisitions for coal cars, which exceeded the number required to handle the tonnage produced by 44 per cent.

Personal Mention

General

Porter Allen, division engineer on the Central Region of the Pennsylvania with headquarters at Cleveland, Ohio, has been promoted to superintendent of the South Bend division with headquarters at Logansport, Ind. Mr. Allen was born on August 15, 1880, at Williamsport, Pa., and was educated at Mercersburg Academy and at LaFayette College. Immediately following his graduation in 1902, he entered railway service as a rodman on the Pennsylvania with headquarters at Williamsport. He held this position and that of instrumentman until March, 1906, when he was promoted to assistant supervisor. He was promoted to supervisor in August, 1911, and continued in this capacity until March, 1920, when he became division engineer, the position he held at the time of his recent promotion.

A. M. Burt, assistant to the vice-president of the Northern Pacific, with headquarters at St. Paul, has been promoted to assistant vice-president with the same headquarters. Mr. Burt was born on May 1, 1866, at Syracuse, N. Y., and was educated in the common schools. He entered railway service in 1885 as a rodman on the Colorado Midland, and held various positions from rodman to division engineer in the employ of that road and the Northern Pacific, the Wisconsin Central, the Adirondack & St. Lawrence and the Chicago & North Western until December, 1896, when he became supervisor of bridges and buildings on the Northern Pacific, a position he held until March 1, 1902 when he entered the operating department as assistant superintendent, at Grand Forks, N. Dak. He was promoted to division superintendent at Jamestown, N. Dak., on October 10, 1903, being transferred later to Fargo, N. Dak., Missoula, Mont., and Spokane, Wash. On January 1, 1914, he was appointed chief engineer maintenance of way, and on April 1, 1918, he was promoted to acting general manager. On August 1, 1918, he became assistant general manager, a position he held until June 1, 1919, when he became assistant director of the Division of Operation of the United States Railroad Administration at Washington, D. C. He returned to the Northern Pacific on March 1, 1920, as assistant to the vice-president, which position he held until his recent promotion.

A. M. Burt

Hadley Baldwin, assistant chief engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Cincinnati, Ohio, has been promoted to assistant to the general manager with the same headquarters, effective June 16, to succeed **L. F. Rose,** promoted to general manager of the Peoria & Eastern.

Mr. Baldwin was born on February 24, 1867, at Marshalltown, Pa., and graduated from the University of Michigan in 1893. He entered railway service in September of that year as masonry inspector and assistant engineer of the Cleveland, Cincinnati, Chicago & St. Louis, was promoted to supervisor of track in February, 1896, and in July of that year was again promoted to resident engineer at East St. Louis, Ill. He was reappointed supervisor of track in January, 1897, and in May, 1898, became engineer maintenance of way at Indianapolis, Ind., where he remained until June, 1902, when he became engineer of construction with headquarters at Cincinnati, Ohio. In November of that year he was promoted to superintendent of the St. Louis division with headquarters at Mattoon, Ill., and again returned to the engineering department in March, 1913, as assistant chief engineer with headquarters at Cincinnati, holding this position at the time of his recent promotion.

B. O. Johnson, formerly roadmaster on the Atchison, Topeka & Santa Fe, has been appointed assistant to the vice-president of the Northern Pacific, with headquarters at St. Paul, Minn. Mr. Johnson was born on May 25, 1878, at Winchester, Mass., and attended the Worcester Polytechnic Institute, following his graduation from which, in 1900, he entered railway service as a track laborer on the Northern Pacific. During 1901 and 1902, he was employed in various positions in the engineering department, and in 1903 was promoted to roadmaster. In 1905, he was appointed roadmaster on the Atchison, Topeka & Santa Fe, and a year later returned to the Northern Pacific as trainmaster. He was promoted to superintendent of the Yellowstone division in 1909, serving later on the Fargo and Montana divisions. In 1917, he went to Russia with the Army of Occupation, as a major of the Russia Railway Service Corps. Mr. Johnson left military service in 1922, and was appointed assistant to the vice-president of the Northern Pacific, with headquarters at St. Paul on May 1, 1923.

B. O. Johnson

Engineering

R. M. Bryant, who has been acting as assistant division engineer of the Western division of the Southern Pacific, with headquarters at Oakland, Calif., has been permanently appointed to this position.

R. D. Brown, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Kingman, Ariz., has been appointed engineer in charge of construction of the new National Railways of Mexico line from Mexicali to the Gulf of California.

Frank Manning, resident engineer on construction of the Flint Belt Railroad, with headquarters at Flint, Mich., has been appointed resident engineer in charge of construction of the new yard and engine terminal on the Pere Marquette, at Erie, Mich., following the completion of the Flint Belt work on June 4.

E. L. Hoopes, division engineer of the Mackinaw division of the Pennsylvania, Northwestern region, with headquarters at Grand Rapids, Mich., has been transferred to the Columbus division of the Southwestern Region, with headquarters at Columbus, Ohio, to succeed **J. L. Taylor, Jr.,** who has been transferred to Cleveland, Ohio, to succeed **Porter Allen,** promoted to superintendent, as noted elsewhere.

F. A. Feikert, roadmaster of the Coos Bay district of the Southern Pacific with headquarters at Marshfield, Ore., has been promoted to assistant division engineer, with headquarters at Portland, Ore. He was born on November 9, 1886, at Orchard, Nebr., and entered railway service in 1907 as a rodman on the Southern Pacific. He left the Southern Pacific in 1907 to become rodman on railway location work on the Oregon-Washington Railroad & Navigation Company, and continued in this work until 1908, when he entered the service of the Northern Pacific, where he was employed in drafting and instrument work for a year. Returning to the Southern Pacific in 1909, he served as instrumentman on maintenance of way until 1912, when he was promoted to

assistant engineer. He was then appointed roadmaster in July, 1922, and served in this capacity until his recent promotion.

S. H. Osborne, acting assistant superintendent of the Nebraska division of the Union Pacific, has been reappointed division engineer of the Nebraska Division with headquarters at Omaha, Neb. **T. J. Bivens,** acting division engineer, on leave of absence, having returned has been appointed assistant engineer, and **R. M. Jolley,** asting division engineer during Mr. Bivens' absence has been reappointed office engineer at Omaha.

E. K. Mentzer, division engineer of the Albany division of the Boston & Albany, with headquarters at Springfield, Mass., has been promoted to principal assistant engineer, with headquarters at South Station, Boston, Mass., to succeed **G. W. Abbott,** resigned to take up private practice. **W. A. Bump,** supervisor, with headquarters at Pittsfield, Mass., has been promoted to division engineer at Springfield to succeed Mr. Mentzer.

Wendell P. Ball, whose appointment as engineer of maintenance of the Pittsburgh & West Virginia and the West Side Belt, with headquarters at Pittsburgh, Pa., was reported in the June issue, was born on September 28, 1888, and was graduated in civil engineering from Allegheny College, Meadville, Pa. Thereafter he spent two years in signal construction work on the Northern Pacific, the Cumberland Valley and other roads, and in 1912 entered the service of the Baltimore & Ohio, where he spent eleven years in the engineering, valuation, construction, cost and maintenance departments, being employed as investigating engineer for that company with headquarters at Baltimore, Md., at the time of his recent appointment.

O. A. Lewis assistant engineer on the Atchison Topeka & Santa Fe, with headquarters at Topeka, Kansas, has been appointed assistant engineer on the Wabash, with headquarters at Moberly, Mo., effective June 1, to succeed **E. N. Rohan,** who has been transferred to Montpelier, Ohio, to succeed **J. A. Buck,** the latter having been transferred to the Chicago Terminals as supervisor to succeed **S. N. Crowe,** who has been transferred to the office of the chief engineer maintenance of way at St. Louis, coincident with the promotion of **R. L. Longshore,** assistant engineer in the office of the chief engineer maintenance of way at St. Louis, to division engineer of the Union Belt with headquarters at Detroit, Mich.

W. T. Borchert, district engineer on the Missouri-Kansas-Texas, has been appointed chief engineer of the Louisiana Railway & Navigation Company, of Texas, with headquarters at Greenville, Tex. He was born on February 24, 1894, at Kyle, Tex., and graduated from the Agricultural & Mining College of Texas in 1913. He entered railway service in June of that year as rodman on the Southern Pacific and thereafter was a draftsman and instrumentman until December 1914, when he was promoted to assistant engineer. Promoted to assistant division superintendent in March, 1917, he continued in this capacity until September, 1919, when he became assistant engineer on the Missouri, Kansas & Texas. He was appointed general foreman in March, 1920, and in September of that year was promoted to district engineer. In December, 1921, he was appointed roadmaster but again became district engineer in May, 1922, and was holding this position at the time of his recent appointment on the Louisiana Railway & Navigation Company of Texas.

Charles Harry Fox, whose promotion to engineer of water service of the Canadian Pacific, Lines West, with headquarters at Winnipeg, Man., was announced in the June issue, was born April 2, 1885, in Winnipeg, and studied at McGill University where he obtained a master of science degree in engineering in 1910. He entered railway service in 1902 as a clerk on the Canadian Pacific and was employed as a clerk, rodman and draftsman intermittently with his studies at college until 1910, when he became resident engineer in the construction department of the Canadian Pacific at Winnipeg. The following year he was resident engineer on maintenance at Ft. William, Ont., and from 1912 to 1915 was assistant division engineer of the Manitoba division. He was promoted to division engineer in 1916, and continued in this capacity at Winnipeg until 1918 when he entered military service. Returning to the Canadian Pacific in 1919, he was employed as division engineer in the maintenance department on the Regina and Saskatchewan divisions until 1920, when he was promoted to assistant district engineer with headquarters at Winnipeg. He was reappointed division engineer at Winnipeg in 1921, and continued in this capacity until his recent promotion.

T. H. McKibben, pilot engineer on the Atchison, Topeka & Santa Fe, has been promoted to division engineer of the Illinois division, with headquarters at Chillicothe, Ill. Mr. McKibben was born at Springfield, Mo., on February 2, 1885, and attended Washburne College. He entered railway service on March 11, 1903, as a chainman on the Atchison, Topeka & Santa Fe and thereafter served successively as rodman, transitman and assistant engineer in charge of second track construction, the latter at Elmer, Mo., until 1907, when he was placed in charge of second track construction at Menton, Mo., where he remained until 1909. Subsequent to 1909, Mr. McKibben was chief clerk to the engineer, Western lines, until 1913, and pilot engineer until 1920, and thereafter chief pilot engineer until his promotion to division engineer of the Illinois division.

Thomas Lees, whose promotion to district engineer on the Canadian Pacific, with headquarters at Calgary, Alta., was announced in the June issue, was born on March 15, 1881 at Ayrshire, Scotland, and from 1897 to 1904 attended the Royal Technical College, at Glasgow, Scotland, and was also employed in the service of a pump manufacturer and the Glasgow & Southwestern railway. Completing his technical studies in 1904, he entered the service of the North British Railway of Scotland, as an assistant engineer, where he remained until 1905, when he became instrumentman on the Canadian Pacific, with headquarters at Winnipeg, Man. Later he was division engineer at Souris, Man., Port William, Ont., Brandon Man. and Vancouver B. C., until 1913, when he was appointed assistant engineer in charge of double tracking at Vancouver. In the following year he was promoted to assistant district engineer with headquarters at Calgary and in 1916 was again appointed division engineer, in which capacity he served until 1919, when he became engineer of water service of the Lines West with headquarters at Winnipeg occupying this position at the time of his recent promotion.

John D. Isaacs, retired as consulting engineer of the Southern Pacific on June 9, after 48 years and 3 months continuous service. He was born on October 6, 1848, at Richmond, Va., and graduated from the University of Virginia, after which he worked for some time as a machinist's apprentice in Baltimore, Md., and Wilmington, Del. On March 1, 1875, he entered the service of the Southern Pacific Company as a draftsman in the maintenance of way department. Shortly thereafter he was appointed chief draftsman and later assistant superintendent of bridges and buildings, and in 1890 became acting superintendent of bridges and buildings. A year later he was promoted to assistant engineer of maintenance of way of the Pacific System, and in 1906 was appointed consulting engineer for the Harriman lines and their subsidiaries, being retained as consulting engineer of the Southern Pacific Company after the dissolution of the Southern Pacific-Union Pacific merger in 1913. In 1878 Mr. Isaacs completed the device which contributed to the development of the motion picture industry, a simple

John D. Isaacs

electro-magnetic release which made it possible to get a series of photographs of a moving object. Mr. Isaacs also invented several railway devices, including a portable wood preserving plant, which, with W. G. Curtis, he perfected in 1892, and the taper rail which did away with compromise joints.

W. B. Hodge assistant engineer maintenance of way on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Springfield, Ohio, has been appointed office engineer with headquarters at Cincinnati, Ohio, effective June 16, to succeed **E. H. McGovern**, who has been promoted to engineer of maintenance of way, with headquarters at Mount Carmel, Ill., succeeding **J. E. Kissell**, transferred to Galion, Ohio, to succeed **W. C. Kegler** who has been promoted to engineer of track and roadway with headquarters at Cincinnati, Ohio, in which position Mr. Kegler succeeds **Paul Hamilton**, who has been promoted to assistant chief engineer, to succeed **Hadley Baldwin**, promoted as noted elsewhere in this issue.

Mr. Kegler was born on March 22, 1887, at Bellevue, Iowa, and was graduated from Notre Dame University in 1899. He entered railway service on June 22, 1903, in the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis and served in various positions, including that of division engineer maintenance of way of the St. Louis division, until April, 1917, when he was transferred to the Cleveland-Indianapolis division. During Federal control, from August, 1918 to 1919, he was district engineer in charge of construction at the close of which he was reappointed division engineer maintenance of way of the Cleveland-Indianapolis division with headquarters at Galion, Ohio, where he was at the time of his recent promotion.

Mr. Hamilton was born on October 5, 1873, at Kingston, Ind., and attended the University of Michigan, from which he was graduated in 1896. He entered railway service in 1900 as an assistant engineer on the Cleveland, Cincinnati, Chicago & St. Louis, and on August 1, 1901, was promoted to supervisor of track. He was promoted to division engineer maintenance of way on June 1, 1902, and held this position until 1912, when he was promoted to superintendent of track and roadway, with headquarters at Cincinnati, which position he was holding at the time of his recent promotion.

Bridge and Building

P. W. McCandless, supervisor of bridges and buildings on the Southern Pacific with headquarters at Dunsmuir, Cal., has been transferred to the Los Angeles division to succeed James Grotto, retired.

Louis Julius, foreman in the water supply department of the Northern Wisconsin division of the Chicago & North Western, has been promoted to supervisor of bridges and buildings on the Lake Shore and Northern Wisconsin divisions, with headquarters at Green Bay, Wis., to succeed William Sweeney, deceased.

J. B. Teaford, supervisor of bridges and buildings on the Southern, Lines West, with headquarters at Lawrenceburg, Ky., has had his jurisdiction extended to include all territory on the Western District east of Huntingburg, Ind., with headquarters at Louisville, Ky., and **E. Veith,** supervisor of bridges and buildings, with headquarters at Huntingburg, Ind., has had his jurisdiction extended to include all territory from Huntingburg to East St. Louis, including branch lines, with the same headquarters, the effect of which is to absorb the territory heretofore under the jurisdiction of L. D. Beatty, who has been appointed to the newly created position of assistant roadmaster.

George Higgins, bridge foreman on the Pere Marquette, has been promoted to supervisor of bridges and buildings on the Chicago-Petoskey division, with headquarters at Grand Rapids, Mich., to succeed Adam McNab, deceased. Mr. Higgins was born in Holland, Mich., on March 22, 1876, and was employed as a carpenter for various contractors from 1896 to December, 1899, when he entered the service of the Pere Marquette in a like capacity. In 1902 he was placed in charge of a concrete gang and continued in this capacity for about five years, when he was placed in charge of carpenter and bridge work, continuing in this work until his recent promotion to supervisor.

Track

William O'Brien has been promoted to supervisor on the Toledo-Ludington division of the Pere Marquette, with headquarters at Toledo, effective June 1.

Carl Cashman has been appointed supervisor of track on the Lehigh Valley with headquarters at Cortland, N. Y., succeeding T. J. Maloney, assigned to other duties.

L. D. Beatty, supervisor of bridges and buildings on the Southern Railway, with headquarters at Princeton, Ind., has been appointed to the newly created position of assistant roadmaster.

J. A. Buck, assistant engineer on the Wabash, with headquarters at Montpelier, Ohio, has been transferred to the Chicago Terminals as supervisor, to succeed S. N. Crowe, transferred, as noted elsewhere in this issue.

F. Schauble, assistant supervisor on the Boston & Albany, with headquarters at Pittsfield, Mass., has been promoted to supervisor, with the same headquarters, to succeed W. A. Bump, promoted, as noted elsewhere in this issue.

J. B. Kelly, inspector of maintenance of the Minneapolis & St. Louis, retired on a pension on June 15, after having been in railway service for more than 50 years. Mr. Kelly was born in 1855, and entered railway service while a boy as a section laborer on the Minnesota Central, now a part of the Chicago, Milwaukee & St. Paul, since which he has been successfully section foreman, extra gang foreman, track supervisor, general roadmaster, and inspector of maintenance on the Chicago, Milwaukee & St. Paul, the Great Northern, St. Louis-Southwestern, and the Minneapolis & St. Louis. He was engaged in the service of the latter road for 14 years.

R. O. Dougherty, supervisor of track on the Minneapolis & St. Louis with headquarters at Conde, S. D., has been transferred to Fort Dodge, with jurisdiction between Des Moines, Ia., and Ruthven, to succeed **Tom Halvorsen,** resigned, and the position of supervisor of track at Conde, S. D., has been abolished. **E. M. Doyle,** supervisor at Oskaloosa, Ia., having resigned, the position of supervisor at that point has been abolished, and the jurisdiction of supervisors, **A. H. Reetz,** at Hampton, Ia., **F. B. Warren,** Marshalltown, Ia., and **George Teyro,** at Monmouth, Ia., have been extended accordingly.

L. E. Keeler, assistant roadmaster of the Middle division of the Michigan Central, at Jackson, Mich., has been promoted to roadmaster with the same headquarters, to succeed **H. M. Bedore,** resigned to engage in other business.

P. M. Krutzler has been promoted to roadmaster of the Coos Bay District of the Southern Pacific, with headquarters at Marshfield, Ore., to succeed **F. A. Feikert,** promoted, as noted elsewhere. Mr. Krutzler was born on March 20, 1888, at Herndon, Kans., and entered railway service in March, 1907, as a section laborer on the Southern Pacific. After serving in this capacity for a year he was appointed section laborer and relief section foreman, which position he held until April, 1909, when he was promoted to section foreman. In October, 1920, he was promoted to section foreman. and continued in this capacity until April 30, 1923, when he was promoted to roadmaster of the Coos Bay District of the Portland division.

Delphi Lewis, track foreman on the Pennsylvania at Milford Center, Ohio, has been promoted to track supervisor on subdivision No. 4, of the Cols division, with headquarters at Richmond, Ind., to succeed **John Texton,** retired on a pension. Mr. Lewis entered railway service as a track laborer on the Pennsylvania at Plain City, Ohio, on July 2, 1901, where he worked until April 1, 1906, when he was promoted to extra gang foreman at Cable, Ohio. On November 16, 1908, he was transferred to Milford Center, Ohio, as a track foreman and remained there until March 1, 1917, when he was promoted to general foreman on subdivision No. 2, on the Cols division. Returning to Milford Center on February 6, 1919,

he served as track foreman until his recent promotion to track supervisor.

Obituary

J. F. Parker, who was general foreman of bridges and buildings on the Coast lines of the Atchison, Topeka & Santa Fe, with headquarters at San Bernardino, Cal., until his retirement in 1917, died in that city on May 23.

A. McNab, supervisor of bridges and buildings on the Chicago-Grand Rapids division of the Pere Marquette, with headquarters at Holland, Mich., died at his home in that city on May 23, after a short illness. Mr. McNab would have completed 50 years of service in August of this year.

W. C. Armstrong, chief engineer of the St. Paul Union Depot Company, with headquarters at St. Paul, Minn., died in that city on June 12. Mr. Armstrong was born on June 21, 1869 in Marshall county, Iowa, and completed a course of study at the Iowa State College in 1881. He entered railway service in the following year and served as transitman and draftsman on the Wisconsin, Iowa & Nebraska (now a part of the Chicago Great Western), until 1883 when he was promoted to chief draftsman. In 1884 he was appointed resident engineer on the Burlington, Cedar Rapids & Northern, and thereafter was employed as a resident engineer on construction consecutively on the Chicago, Milwaukee & St. Paul, the Minneapolis, St. Paul & Sault Ste. Marie and the Eastern Minnesota (now a part of the Great Northern) until 1890, when he became engineer of track and bridges on the Pacific extension of the Great Northern. In 1894 he was promoted to bridge engineer at Spokane, Wash., and in 1895 left railway service to become designer for the Toledo Bridge Company. He returned to railway service in 1899 as resident engineer on the Chicago & North Western, being promoted to bridge engineer in 1902. In 1905 he was appointed superintendent of construction on the Missouri Pacific at Sedalia, Mo. He was appointed bridge engineer of the Chicago, Rock Island & Pacific in 1906, and in 1907 returned to the Chicago & North Western as terminal engineer in charge of the construction of the new passenger station at Chicago. He was promoted to engineer of bridges in 1912, and in February, 1916, was appointed chief engineer of the St. Paul Union Depot Company in charge of the building of the new terminal at that point.

Class 1 railroads in the United States had a net railway operating income for April of $83,197,800, which represented a return on the annual basis of 6½ per cent on their tentative valuation, according to reports filed by the carriers with the Interstate Commerce Commission. In April of last year, the carriers had a net operating income of only $49,979,000, which was equivalent to an annual return of 3.99 per cent.

The American Railway Association has organized regional advisory boards at five strategic points throughout the country, to advise and work with the district managers of the car service division of the association. The boards are composed of representatives of shippers, agricultural, banking and other business interests and comprise standing committees of men actively engaged in producing or dealing in specified commodities.

Floods, said to be the worst in the history of the two states, occurred in South Kansas and Oklahoma during the second week in June which caused serious interruption to operations and heavy damages to property on most of the roads in the region affected, including the Santa Fe, the Rock Island, the Frisco and the Missouri-Kansas-Texas. Part of the Frisco bridge over the South Canadian river at Thomas, Okla., was washed away, and the Kansas City, Mexico & Orient bridge a few miles upstream was so seriously threatened that traffic over it was temporarily abandoned. The Santa Fe lost 600 feet of bridge over the Canadian river at Canadian, Texas, and also lost bridges between Pratt, Kan., Wichita, Calista and Kingman, Ariz. The Fort Worth & Denver City also suffered washouts along the Canadian river, and the Rock Island line from Wichita, Kan., south to Oklahoma state line was closed for six days.

Construction News

The Atchison, Topeka & Santa Fe will construct additional yard tracks at Los Angeles, Cal., to cost approximately $195,000.

This company will call for bids for the construction of a one-story machine shop, 50-ft. by 200-ft. at Guthrie, Okla., and jointly with the Chicago, Rock Island & Pacific, the Missouri-Kansas-Texas, and the St. Louis-San Francisco, will construct a union passenger station at Oklahoma City, Okla., the State Supreme Court having sustained the order of the Oklahoma Commission.

The Baltimore & Ohio has awarded a contract to the Jobson-Gifford Company, New York, for the erection of new superstructures for two highway bridges over its lines at Clayton and Barksdale, Md., and for the erection of a new span in a railroad bridge at Canton, Baltimore, Md. This company has awarded a contract to the Vang Construction Company, Cumberland, Md., for 13 bridges on its Pittsburgh-Wheeling line and a contract to the Pittsburgh Construction Company, Pittsburgh, Pa., for seven other bridges on the same line, the twenty bridges to require about 700 tons of steel.

The Bessemer & Lake Erie closed bids on June 25 for dredging between its docks and for the construction of a concrete dock front at Conneaut Harbor Ohio, this work to involve 123,000 yds. of excavation, 10,600 yds. of reinforced concrete and 43,000 lin. ft. of concrete piles.

The Canadian National has authorized the appropriation of $2,307,000 for the construction of a branch line from Kamloops, B. C., to Lumbi and Kelona.

This company closed bids on June 18 for the construction of water supply facilities at Avonlea, Sask., to consist of a 50,000,000 gal. reservoir to be created by constructing an earthen dam. This company will also construct a 400,000,000 gal. reservoir at Regina, Sask., to include a pump, pumphouse and seven miles of pipe line, and will construct a 50,000,000 gal. reservoir at Kipling, Sask., the latter, also, to involve the construction of an earth dam.

The Canadian Pacific has awarded a contract to W. A. Dutton, Winnipeg, Man., for the grading of the first section of the Wymark branch, reported in the May issue, and is now making surveys in Northern British Columbia to determine the location of a proposed extension of the Edmonton, Dunvegan line to the Pacific Coast, a distance of approximately 450 miles. This company plans the construction of a passenger terminal and office building at Victoria, B. C., for the accommodation of steamship traffic and the steamship offices, the cost of the building to be about $200,000.

The Chesapeake & Ohio has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a 30,000 gal. capacity water treating plant at Peach Creek, W. Va.

The Chicago & Alton plans the construction of a new roundhouse and complete terminal facilities at Ridgeley, Ill.

The Chicago & Eastern Illinois plans the construction of new locomotive and car shops at Terre Haute, Ind., and has purchased land for the site of the buildings.

The Chicago & North Western has awarded a contract to the Howlett Construction Company, Moline, Ill., for the erection of a 250-ton frame coaling station at Belle Plaine, Iowa, and a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 150-ton concrete coaling station at Stambaugh, Mich.

This company, jointly with the city of Milwaukee, Wis., will construct an ornamental bridge over Madison street in that city. The total cost of the bridge will be approximately $400,000, of which the North Western will furnish $100,000.

The Chicago, Burlington & Quincy closed bids June 25, for the construction of a 250-ton coaling station at Ottumwa, Ia., a 150-ton coaling station at Sesser, Ill., and a 300-ton coaling station at Hannibal, Mo., and has awarded a contract

to Morris & Daugherty, St. Paul, Minn., for the grading of the 17 mi. cut-off, between Frederick, Ill., and Vermont, mentioned in the issue of August, 1922.

The Chicago, North Shore & Milwaukee will construct a new passenger station at Highland Park, Ill., plans for which have been completed.

The Chicago, Rock Island & Pacific contemplates the construction of an addition to its engine house and shops at Caldwell, Kan., to cost approximately $40,000.

The Columbus Belt will construct a 12-mile belt railroad around the city of Columbus, Ohio, starting six miles west of the Union station and circling the city to the south and east. The company is now applying for a charter. The project is estimated to cost approximately $12,000,000. John E. Bleekman, 1105 Atlas building, Columbus, Ohio, is president of the company.

The Cowlitz Development Company has begun the construction of 10 miles of logging road east of Castle Rock, Cowlitz county, Wash.

The Denver & Rio Grande Western will construct a coaling station at Green River, Utah, and a water treating plant at Goshen, Utah, also a new passenger station at Ignatio, Colo., to replace one destroyed by fire. This company will construct a new freight yard at Alamosa, Colo., at a cost of $68,000, a new passenger station to cost $36,000 at Walsenburg, Colo., and has awarded a contract to Battey & Kipp, Inc., Chicago, for the construction of additions to its engine facilities at Denver, Colo. and Salt Lake City, Utah.

The Florida East Coast has authorized the construction of new engine terminals at New Smyrna. A new passenger station at Daytona will be ready for service before the end of the year. There will be started this year the reconstruction of the bridge over the St. Johns river into Jacksonville, the present single track structure to be replaced by a double-track bridge. The company is completing in St. Augustine, the second unit of its general office building system, and proposes to complete the extension from Okeechobee as far south as Pahokee by the end of the present year, a contract having been awarded to M. J. Cole, Jacksonville, Fla., for the construction of the first section, approximately 20 mi. long.

The Ft. Worth & Denver City will construct temporary shops at Childress, Tex., to replace buildings recently destroyed by fire.

The Great Northern is planning to construct approximately 80 miles of line from Java, Montana, on the main line, east to Augusta, the western terminus of a line from Great Falls, Mont., on the line of the partly completed secondary main line through Montana.

The Houston & Texas Central will soon call for bids for the construction of the cut-off 8½ mi. long, connecting the tracks east of Dallas, Texas, with those running south. The work is estimated to cost $600,000.

The Edward Hines Yellow Pine Trustees have received a certificate from the Interstate Commerce Commission authorizing the construction of a 9.97 mile extension from Kiln, Miss., to a connection with the Louisville & Nashville at Bay St. Louis.

The Illinois Central has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of water treating plants at Dixon, Ill. and Panola, and closed bids on June 27 for water treating plants at Millington, Tenn. and Brookhaven, Miss. A contract was awarded to the Ellington-Miller Company, Chicago, for the construction of two subways at Princeton, Ky., to cost approximately $60,000.

This company has awarded a contract to J. C. Lynch, Monmouth, Ill., for the construction of 7 miles of second track from Springfield, Ill., to Barclay, and a double track bridge across the Sangamon river. This company will close bids on July 12 for the construction of the new single track line from Edgewood, Ill., to Fulton, Ky., reported in the January issue.

The Kansas City Southern plans the construction of a stucco passenger station at DeQuincy, La.

The Lawerino Company, through Channing M. Ward, of Richmond, Va., has applied to the Interstate Commerce Commission for a certificate authorizing the operation of steamboat, ferry and barge lines on the Potomac river and the construction and operation of a railroad from Persimmon point to Lyell's and Warsaw, Va., about 40 miles.

The Leon & Manuel Doslado Railroad Company has been organized under a concession granted by the state of Duan Juato, Mexico, to construct a railway between Leon and Manuel Doslado, a distance of about 100 miles. It is reported that the project has been financed and that the building of the new line will be started in the near future.

The Louisville & Nashville contemplates the construction of a branch line approximately 30 mi. long from McRoberts, Ky., to a connection with the Carolina, Clinchfield & Ohio, at Elkhorn City.

This company plans the construction of a one-story machine shop at Etowah, Tenn., to cost approximately $30,000.

The Michigan Central will elevate its tracks at Green street and Central avenue, Detroit, Mich. This company has awarded a contract to the Ellington-Miller Company for the construction of an extension to its roundhouse at West Detroit, Mich., to cost approximately $80,000.

The Mississippi Central will relocate and reduce the grade on five miles of its main line near Hattiesburg, Miss., at a cost of approximately $100,000.

The Missouri Pacific has awarded a contract to H. W. Underhill & Company, Wichita, Kan., for the construction of a 120-ft. by 160-ft., one story engine house and repair shop at Wichita, Kan., and has awarded a contract to the Folwell-Ahlskog Construction Company, Chicago, for the construction of a one-story, reinforced concrete shed at St. Louis, Mo., the latter to cost approximately $100,000. Another contract has been awarded to the same construction company for the erection of a one-story, concrete boiler house adjacent to the new grain elevator at St. Louis.

The Mobile & Ohio closed bids July 3 for the construction of the roundhouse and shop building at Jackson, Tenn., reported in the June issue.

The National Railways of Mexico plans the construction of a branch line from Mexicali, Lower California, to the Gulf of California, surveys for which have been completed; also, the construction of a new line approximately 87 miles long from Beristain, Mexico, to Tuxtan, to cost approximately $4,000,000. This company is making efforts to finance the completion of the line from Allende, Coahuila, Mexico, to Villa Atuna, a point across the Rio Grande river from Del Rio, Tex., a line approximately 75 miles long, a part of the work on which is finished. The cost of completion is estimated at approximately $1,000,000.

The Mexico government has begun the construction of a line from Ciudad, Silao, Guanajuato, to Manuel Doslado.

The New Mexico Central has applied to the Interstate Commerce Commission for authority to construct a 100 mi. extension of its line from Santa Fe to Gallina, N. M.

The New York Central recently called for bids of 3,700 ft. of 16 in. cast iron pipe at Gibson, Ind.

The New York, Chicago & St. Louis will construct 11 miles of second track from Lorraine, Ohio, to Vermilion, and plans extensive enlargements of its yards at Bellevue, Ohio, the land for which has already been purchased.

The Northern Pacific closed bids on June 21 for the construction of a 28-stall roundhouse at Missoula, Mont., and has authorized the immediate construction of a new passenger station at Miles City, Mont., to cost approximately $50,000. This company has been authorized by the Interstate Commerce Commission to construct a branch line approximately 30 miles long in Rosebud county, Mont., to the company's coal fields, which was reported as contem-

plated in the March issue. The project will cost approximately $1,900,000.

An Oregon Lumber Company, with offices at St. Maries, Ida., and represented by Fred Herrick, plans beginning at once the making of surveys looking to the construction of 80 miles of line northwest from Crane, Ore., via Burns to the Malheur National Forest, to be completed before the close of 1924.

The Oregon Short Line has been authorized by the Interstate Commerce Commission to proceed with the construction of a branch line 2½ miles long at Nampa, Idaho.

The Oregon-Washington has been ordered by the Public Service Commission of Oregon to construct a 240-ft. viaduct over its tracks at Oro Dell, Ore., to cost approximately $57,000 and plans extensions to the freight terminal facilities at the Albina docks at Portland, Ore., consisting of one dock with shed, 137-ft. by 360-ft.; one open wharf, 80-ft. by 120-ft.; one warehouse, 119-ft. by 300-ft.; one grain elevator of 310,000 bu. capacity, and a double-track trestle, 180-ft. long. Approximately 3,000-ft. of additional storage tracks will also be constructed.

The Pennsylvania is building a gravity type masonry dam in the Tipton Valley, 10 miles east of Altoona, Pa., to increase the water supply of its shops at that point, the dam to be 400-ft. long and 78-ft. high with a 60-ft. base in solid rock, the effect of which will be to create a 32-acre lake with a capacity of 250,000,000 gal. The total cost of the work is estimated to be in excess of $500,000.

This company is beginning the construction of a second track from Toledo, Ohio, to Mansfield, and will begin at once a program of improving and enlarging existing facilities in the Northwestern region at a cost of over $2,000,000. The tracks at Fifty-fifth street, Chicago, will be elevated at a cost of $616,000 and additional tracks will be laid in the Fifty-ninth street yard. Additions to the shops at Fifty-ninth street will cost $121,000, a new team track and driveway facilities will be constructed at Sixty-third street, the slip at the coal docks at Sandusky, Ohio, will be deepened at a cost of $301,000 and a second track will be constructed from Webb, Ohio, to Walbridge, with a 125-car siding at Webb, to cost $400,000. Other improvements which have been authorized include the extension of tracks at Crestline, Ohio, at a cost of $399,000; additional tracks at Mansfield, Ohio, to cost $73,000 and a 110-ft. turntable at Ft. Wayne, Ind.

This company has awarded a contract to Henry A. Hitner's Sons Company, Philadelphia, for the removal of its train shed at Broad Street station, Philadelphia, recently damaged by fire.

The Pere Marquette has awarded a contract to M. Babbitt & Sons, Toledo, Ohio, for the construction of the terminal facilities at Erie, Mich.

The Philadelphia & Reading, in connection with the elimination of certain grade crossings and changes in the highways at Elkins Park, Pa., has awarded a contract to C. P. Bower, Philadelphia, Pa., for the construction of a three-span concrete and steel overhead bridge south of Ashbourne road.

The St. Louis-San Francisco has awarded a contract to the T. S. Leake Construction Company, Chicago, for the construction of new terminal facilities at Tyler Avenue, St. Louis, Mo., to include a 20-stall roundhouse, a power plant and two washrooms, to cost approximately $500,000; has awarded a contract to John M. Olson, Springfield, Mo., for the construction of the terminal facilities at East Thomas, Ala., reported in the April issue, and will construct a new passenger station 45-ft. by 275-ft. at Springfield, Mo., to be built in California mission style, and to cost approximately $125,000.

The Southern will construct a brick and concrete addition to its passenger station at Chattanooga, Tenn., at a cost of approximately 30,000; will construct a new planing mill at Princeton, Ind., and will remodel the old mill and boiler shop at that point, estimated to cost $275,000.

The Texas & Pacific plan the construction of a new roundhouse and engine terminal at Dallas, Texas, the land for which has already been purchased.

The Trinity & Brazos Valley is laying out the new town of Mildred, about six miles from Corsicana, Tex., where a freight and passenger station and side tracks will be constructed.

The Union Pacific has awarded a contract to Ziegler Dalton Construction Co., Junction City, Kan., for the construction of a passenger station at Hays, Kan., reported in the June issue, and will construct a six stall roundhouse at Topeka, Kan., where it also plans the construction of a new machine shop.

This company has completed plans, involving an expenditure of $300,000, for the laying out of an industrial site in Denver, Colo., adjacent to its tracks, to be 3,125-ft. long and 1,000 ft. wide, where streets will be laid out and the area divided into factory sites.

This company, through a holding company known as the Kansas City Industrial Land Company, has acquired 919 acres of land in the north Missouri river bottom, Kansas City, Kan., which, it is understood, will be used in the development of a new industrial district.

The Wabash will relocate its line at Randolph, Mo., at a cost of $76,000 and will construct viaducts at a total cost of $324,000 at Calhoun street, Fort Wayne, Ind., and Hastings street, Detroit, Mich. The company will also construct a plate girder bridge at O'Fallon, Mo., to cost $115,000; will enlarge a dock at Detroit, Mich., at a cost of $60,000, and will construct a reservoir at Stanberry, Mo., at a cost of $28,000.

The Western Maryland has awarded a contract to the Price Construction Company, Baltimore, Md., for the erection of a two-story reinforced concrete office building and warehouse, 45-ft. by 200-ft.

The Western Pacific will construct additions to its car and locomotive shops at Sacramento, Cal., at a cost of approximately $225,000.

Equipment and Supplies

The Baltimore & Ohio has ordered 250 tons of structural steel from the Fort Pitt Bridge Works for bridge work.

The Chicago, Burlington & Quincy issued inquiries during the month for 1,880 tons of structural steel for bridge and car work in Chicago.

The Chicago & Eastern Illinois has ordered 10,000 tons of rail from the Illinois Steel Company.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 1,200 tons of structural steel from the McClintic Marshall Company for bridge work.

The Delaware & Hudson issued an inquiry during the month for from 700 to 800 tons of bridge steel to rebuild the present bridge at Troy, N. Y.

The Louisville & Nashville issued inquiries during the month for 280 tons of structural steel for bridges at Louisville, Ky.

The Missouri Pacific has ordered 372 tons of structural steel from the Virginia Bridge & Iron Company for bridge work.

The New York Central has inquired for 200 tons of steel for bridges and has ordered rail as follows: Bethlehem Steel Co., 67,500 tons; Illinois Steel Co., 57,100 tons; Carnegie Steel Co., 13,350 tons; and Inland Steel Co., 12,050 tons.

The Pennsylvania has ordered 10,000 tons of steel rail from the Carnegie Steel Company.

The St. Louis-San Francisco issued an inquiry during the month for 325 tons of structural steel for shops at Lindenwood, Mo.

The Southern Pacific was reported to be in the market during the month for 50,000 tons of steel rail.

The Southern Pacific has ordered 14,000 tons of rail from the Tennessee Coal, Iron & Railroad Company, for delivery during the latter part of 1923 or in 1924.

The Tennessee Central has ordered 3,000 tons of 80-lb. rail to be delivered in August from the Tennessee Coal, Iron & Railroad Company.

Supply Trade News

General

The Chicago Bridge & Iron Works will erect an addition to its factory at Greenville, Pa.

The consolidated purchasing agency of the American Short Line Railroad Association, has moved from the Railway Exchange building, Chicago, to 1832-35 McCormick building, pursuant to the consolidation of all offices of the association.

The B. F. Sturtevant Company, Hyde Park, Boston, Mass., has bought the plant of the Wisconsin Engine Company, makers of Corliss pumping engines at Corliss, Wisconsin. **Harry W. Page** has been appointed general manager and will be in charge of the Wisconsin plant. Mr. Page is a graduate of the University of Wisconsin, and for the past six years, has been assistant general manager at the main works of the B. F. Sturtevant Company, Hyde Park, Boston.

The Surplus Steel Exchange Inc., has been formed for the purpose of presenting an outlet for surplus stock material of steel products. A commission will be charged only on sales actually made, as the exchange will not buy material but act solely in the capacity of agent. The officers of the new company are: **Robert D. McCarter,** president; **George E. Dix,** vice-president; **William L. Cooper,** treasurer, and **Edward Michaud,** secretary and general manager, with offices at 7 Dey street, New York City.

Personal

L. M. Dalton has been appointed manager of the Boston office of the Link Belt Company, succeeding E. J. Burnell, resigned.

P. E. Carhart, inspection engineer of the Illinois Steel Company, with headquarters at Chicago, having retired on account of ill health, has been appointed consulting inspecting engineer with unassigned duties.

H. C. Jones, vice-president of the Inland Steel Company, in charge of the Chicago Heights plant and of advertising, with headquarters at Chicago, has resigned to engage in private business. **W. C. Carroll,** vice-president, will be in charge of advertising.

William S. Boyce, who has been western manager of the Lundie Engineering Corporation, with office in Chicago, for the past 2½ years, has resigned to become connected with the sales department of the Railroad Supply Company, with the same headquarters.

H. C. Berckes, who has been connected with the Southern Pine Association almost since its organization in 1915, and who has been assistant secretary since 1919, has been elected secretary-manager of the association on June 21, to succeed **J. Rhodes,** who died on June 2.

L. B. Armstrong, assistant secretary of the Lundie Engineering Corporation, has been transferred from the headquarters at New York, to Chicago, as western manager with offices at 166 West Jackson Boulevard. Mr. Armstrong has had a long experience as a steel and railroad man.

W. O. Bruning has been appointed chief engineer of the Louisville Frog & Switch Company, with headquarters at Louisville, Ky. Mr. Bruning studied mechanical engineering at the University of Kentucky, after which he taught for a year. Since that time Mr. Bruning has been engaged largely in the design of special track work for electric and steam railroads, except for a period during the war when he was in aviation service.

D. B. Stokes, formerly Western sales manager of the United States Cast Iron Pipe and Foundry Company, has been appointed general sales manager with headquarters in the Morris building, Philadelphia. **W. G. Savage,** formerly eastern sales manager, has been appointed western sales manager with headquarters in the Peoples Gas building, Chicago. **C. E. Braun** has been appointed assistant western sales manager with headquarters in Chicago.

Clyde M. Carr, retired president of Joseph T. Ryerson & Son, Inc., died on June 5, in Chicago, after an illness of several weeks. A photograph of Mr. Carr and a sketch of his career appeared in the March issue, following his retirement.

T. A. Orton, secretary and treasurer of the Orton & Steinbrenner Company, Chicago, has been elected president to succeed H. E. Steinbrenner, who has sold his interest in the company. **H. Mertz,** assistant secretary has been elected secretary and sales manager. **H. Shaffer,** purchasing agent has been elected treasurer and purchasing agent, and **D. L. Niederst,** chief draftsman has been promoted to chief engineer.

Norman F. Brown, vice-president of the Dravo Contracting Company, Pittsburgh, Pa., has resigned, effective June 1. Mr. Brown will open an office in Pittsburgh, Pa., to engage in private practice as a consulting engineer dealing with railroad and transportation problems and municipal work. He served as assistant to the chief engineer on the Pennsylvania Railroad, and director of the Department of Public Works, in the City of Pittsburgh, prior to his connection with the Dravo Contracting Company.

E. A. Batchelder, Jr., secretary to the president of the Union Pacific with headquarters at Omaha, Nebr., has opened offices in the Lytton building, Chicago, where he will engage in the handling of railway supplies. Mr. Batchelder was for several years employed in the operating and executive department of the Chicago & North Western at Chicago, and was later promoted to secretary to the president. During federal control, he was secretary to R. H. Aishton, regional director of the North Western region and upon the resumption of private control of the railroads, served as secretary to the president of the Union Pacific, with headquarters at Omaha, Nebr., until his recent entry into the supply business.

John Edgar Rhodes, for the last eight years secretary-manager of the Southern Pine Association, died on June 2, in Touro Infirmary, New Orleans, La., after an illness of about two months. He was born at Kent, Ohio, on July 9, 1874, and began his career in newspaper work. He subsequently served as private secretary to an officer of the Northern Pacific, secretary of the Minnesota Logging Company and then returned to newspaper work. In 1898 he was appointed secretary-manager of the Northern Pine Association. Ten years later he became connected with the Weyerhaeuser timber interests. In 1912 he became publisher and editor of the Tacoma (Washington) Tribune and when that paper was sold was appointed secretary-manager of the National Lumber Manufacturers' Association with headquarters in Chicago. Since 1915 he served as secretary-manager of the Southern Pine Association.

Trade Publications

Welding Rods.—The Manganese Steel Forge Company, Philadelphia, Pa., has issued a small folder describing and cataloging its line of Rol-Man Manganese Steel Welding Rods which serve as the supply of metal applied in the gas and electric welding processes, with special reference to track work. Brief suggestions are also included with respect to the practices to be followed in carrying out this work.

Waterproofing Methods and Materials.—A 32-page, illustrated, large-size bulletin has recently been issued by Gardner & Lewis, Inc., New York, with an enclosed set of specifications for the Karnak waterproofing manufactured by this company. The bulletin gives a detailed summation of the requirements of various technical societies for waterproofing as well as the results of numerous tests made by laboratories and consulting engineers. A table is included of a large number of railway and other bridges and buildings, showing the asphalt specifications at various temperatures and the cloth specifications for each structure. Considerable space is given to the discussion of the various classes of asphalts and membranes and their characteristics. Methods of construction are explained and illustrated for specific problems.

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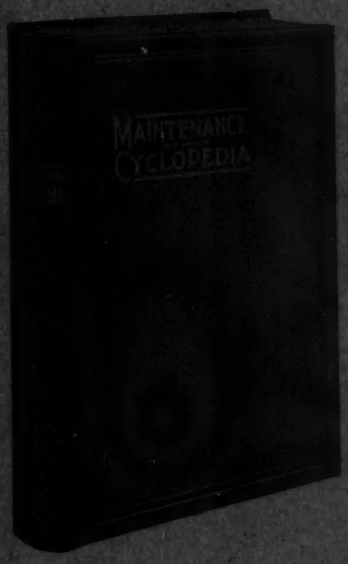

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Assisted by

Homer Hughes, Associate Editor, Formerly Assistant Field Engineer, Interstate Commerce Commission

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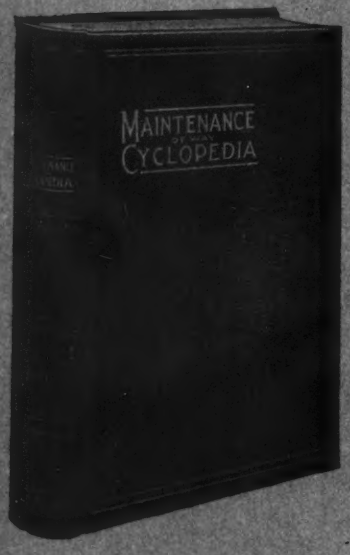

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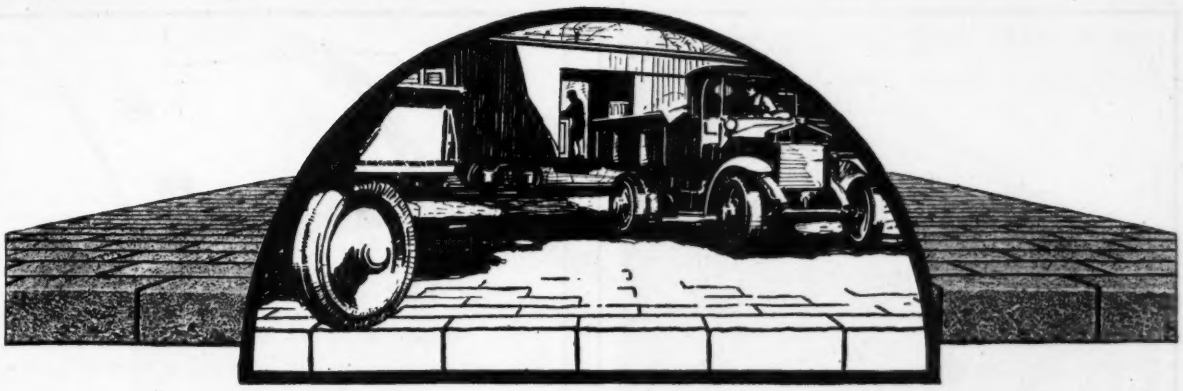

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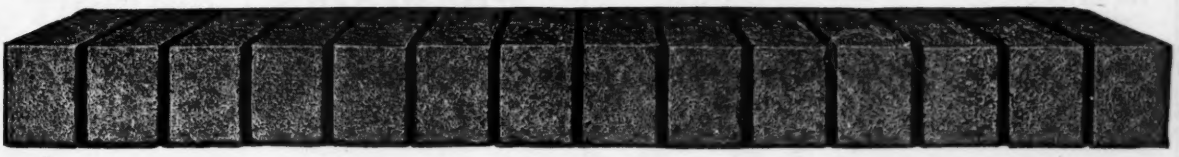
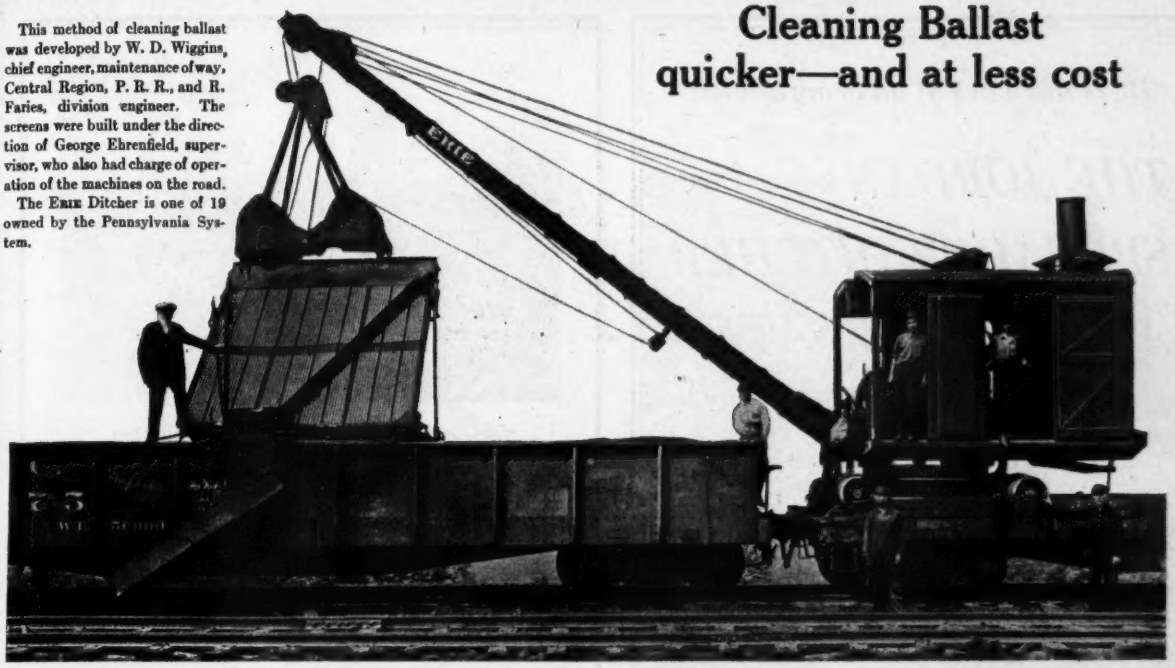


Cleaning Ballast quicker—and at less cost

This method of cleaning ballast was developed by W. D. Wiggins, chief engineer, maintenance of way, Central Region, P. R. R., and R. Faries, division engineer. The screens were built under the direction of George Ehrenfield, supervisor, who also had charge of operation of the machines on the road.

The ERIE Ditcher is one of 19 owned by the Pennsylvania System.



Another of the ways in which ERIE Ditchers are cutting costs on railroad construction and maintenance.

CLEANING BALLAST: When using the method shown by the above photo, the ballast is first forked to the space between the tracks, then picked up by the ERIE Crane with Clamshell Bucket. The ballast is dumped to a screen mounted on a steel gondola. Dirt goes through the screen into the car, while the clean ballast runs off the screen down through the chute, and back to the track center.

After the clean ballast has been leveled off, the track is ready for a light dressing of new stone.

Using the ERIE Ditcher for ballast cleaning, 2 laborers, a foreman, and a regular train crew will do the work of about 40 hand laborers. Working day and night shifts the ERIE shown above cleaned as high as 3936 feet of center ditch on one Sunday; on one single week-day shift of 8 hours, it cleaned 1750 feet. An average of two months' work is approximately 1000 feet per shift of 8 hours.

Besides the great saving in labor and the greater progress made, the ballast is much cleaner than when the hand method is used and there is less stone wasted.

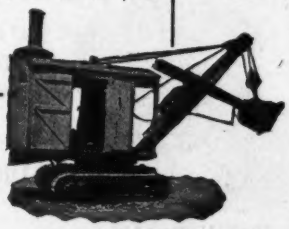
We have some very interesting photos and data which will give you a clear idea of how the ERIE will speed up your work and save you labor on railroad ditching, slide removing and many other kinds of work. Will be glad to send them to you without obligation. Just write us.

With ditcher boom and dipper, for ditching service

After using your ERIE as locomotive crane with clam shell bucket for ballast cleaning, handling scrap, refuse or bulk material, or for handling rails, timbers, etc., it's an easy job to put on the ditcher boom and dipper for ditching or for removing slides. You don't send the ERIE to the shops to put on the ditching equipment—any ordinary mechanic can easily do the work in a few hours right on the job.

Used for all kinds of excavating

The ERIE also gives splendid results digging scale pits, turntable pits, roundhouse or shop foundations, grading for double track, new spur tracks or new roadbed. The all-around usefulness of the ERIE Ditcher is just another reason why so many railroad officials prefer the ERIE.



Can be quickly mounted on traction wheels, or the ERIE *lubricated* caterpillar type mounting, for operating on the ground and traveling under its own power. The three different kinds of mounting are easily interchangeable on the same truck frame.

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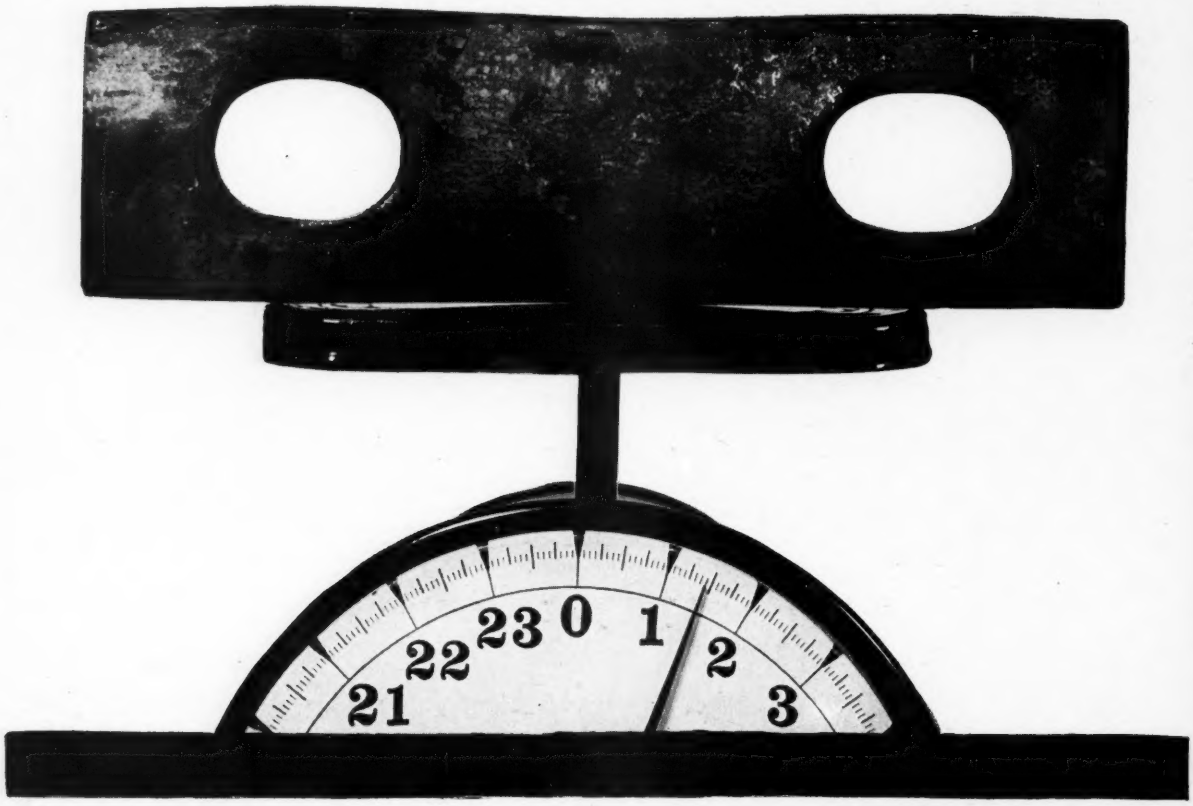

You are paying for steel

Steel is inexpensive to use; but very expensive to waste.

When steel is made into nut locks a large part of it is never recovered. The scrap value of the worn nut lock is so small that it is seldom saved.

But when steel is made into a big, heavy rail joint spring, the bulk of it can be recovered or salvaged after the spring itself outlives its usefulness. So in all fairness you should deduct the scrap value of the spring when considering its initial price.

There are other items to deduct as well.

Deduct cost of periodical bolt tightening.
Deduct cost of worn joints.
Deduct cost of battered rail ends.
Deduct cost of joint tie abrasions.
Deduct cost of wrecks, derailments and delays.

Verona Rail Joint Springs will save their cost many times before you salvage their final value as scrap. They are of heavy steel—expensive to waste but very inexpensive to use.

VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco New Orleans Montreal Washington